A350
TECHNICAL TRAINING MANUAL
MAINTENANCE COURSE - T1+T2 - RR Trent XWB
Fire Protection Systems

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FIRE PROTECTION SYSTEMS

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V2414251 - V00T0MM0

ENGINE FIRE PROTECTION DESCRIPTION (2/3)

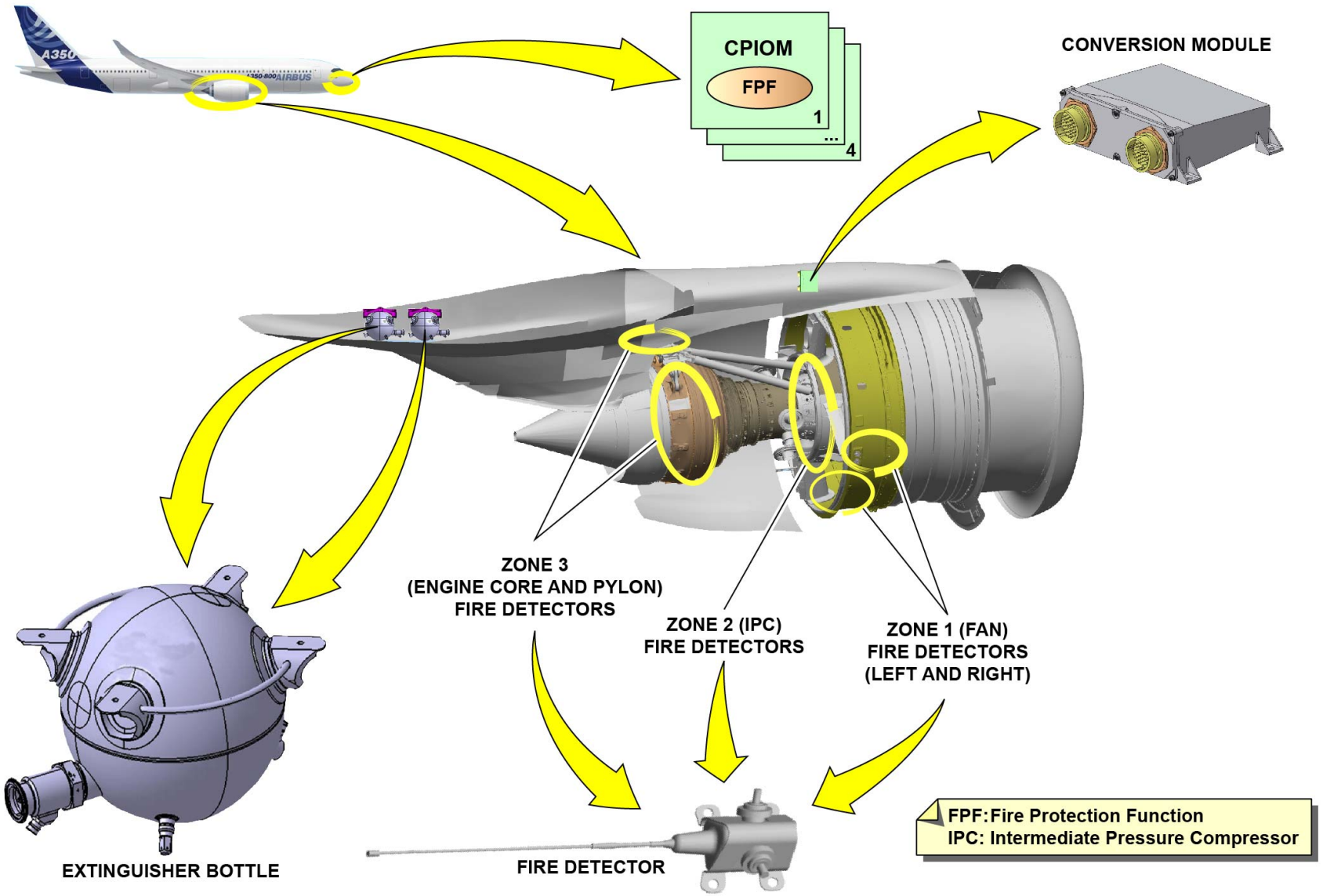
Engine Fire-Protection General Presentation

The engine fire protection system has two subsystems:
- An engine fire-detection subsystem
- An engine fire-extinguishing subsystem.

The engine fire-detection subsystem monitors the two engines for a fire or an overheat occurrence.
The engine fire-extinguishing subsystem stops the fire.
The primary components of the Fire Protection Function (FPF) are:
- The fire detectors
- Two fire-extinguisher bottles for each engine
- One Conversion Module (CM) for each engine
- The FPF application hosted in four CPIOMs.

For each engine area, three fire zones are monitored:
- Zone 1, related to the engine fan zone with two pairs of fire detectors (left and right fire detectors)
- Zone 2, related to the engine intermediate pressure-compressor zone with one pair of fire detectors
- Zone 3, related to:
- The engine core zone with one pair of fire detectors
- The pylon zone with one pair of fire detectors.

V2414251 - V00T0MM0 - VM26D1ENGIN3001



ENGINE FIRE-PROTECTION GENERAL PRESENTATION

ENGINE FIRE PROTECTION DESCRIPTION (2/3)

Engine Fire-Detection Function/Description

There are two independent loops (loop A and loop B) of fire detectors installed on each engine.
There are fire detectors for the loop A and fire detectors for the loop B installed in each zone.
There is one CM for each engine. Each CM has two channels: one channel for each loop.
The CM channels change the analog signals of the fire detectors into digital signals and send them to the related FPF application.
The FPF applications are hosted in four CPIOMs. One CPIOM/FPF application is used for each CM channel/loop. The two FPF applications related to an engine, exchange data to monitor the fire detectors.
The FPF applications trigger a fire alarm if there is:
- A fire detected by the two loops in a common zone
- One defective loop in a zone and the other loop detects fire in the same zone.

For cockpit fire warnings, the FPF applications have interfaces with:
- The FWS
- The FIRE Integrated Control Panel (ICP)
- The engine master control panel.

The FPF applications are interfaced with the CMS to do a check of the resistance and continuity of the detectors through a CMS test.
The FIRE TEST P/BSW installed on the FIRE ICP is used to do an engine fire operational test in flight or on ground.

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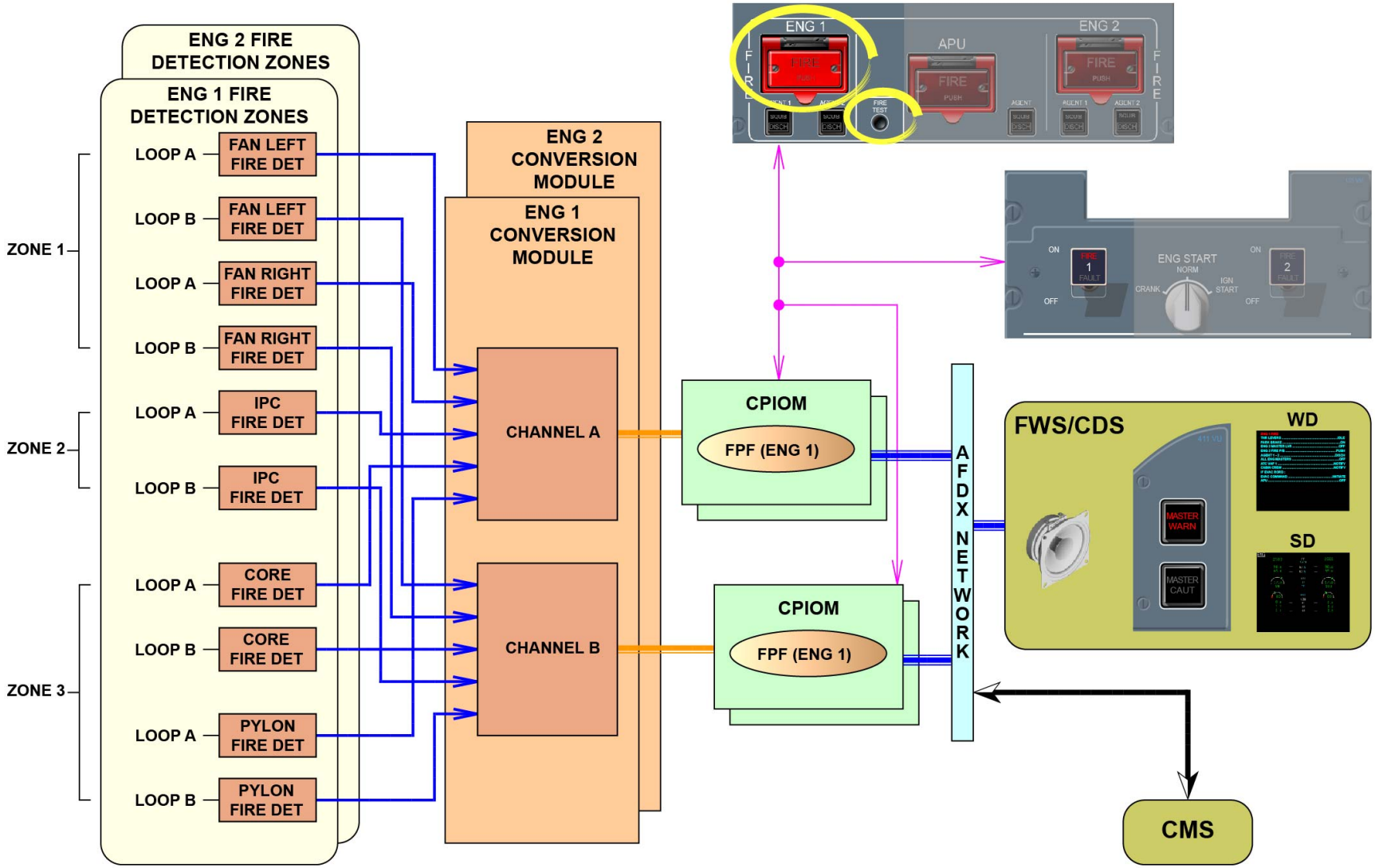

ENGINE FIRE-DETECTION FUNCTION/DESCRIPTION

V2414251 - V00T0MM0 - VM26D1ENGIN3001

ENGINE FIRE PROTECTION DESCRIPTION (2/3)

Engine Fire-Detection Function/Description (continued)

Fire detectors description

The fire detectors use the electro-pneumatic technology.
Each fire detector has:
- A sensing element
- A responder assembly.

The sensing element is a tube charged with gas and the responder assembly senses the pressure variation of this gas.
The responder assembly has a chamber with two pressure switches:
- An alarm switch
- An integrity switch.

The responder assembly supplies three different signals (normal, alarm or fault) related to a resistance variation. The positions of the pressure switches change the resistance value.
In normal condition (normal state), the integrity switch is closed and the alarm switch is open.
When the alarm operates (alarm state), an overheat (hot gas) or a fire (flame) increases the sensing element gas-pressure. This closes the alarm switch.
If there is a fault (fault state), the gas pressure decreases (sensing element damage). This opens the integrity switch and generates a fault signal.

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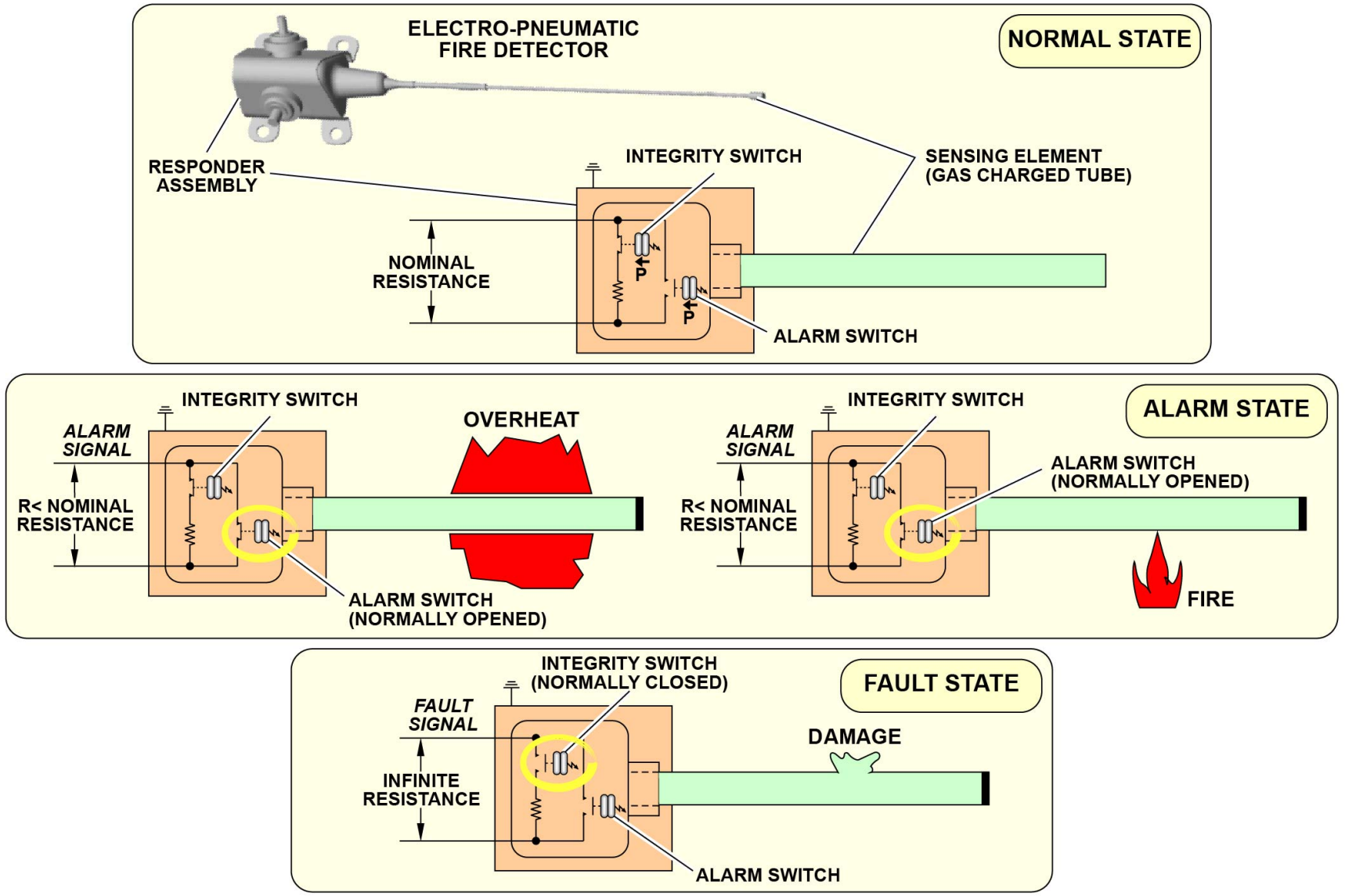

ENGINE FIRE-DETECTION FUNCTION/DESCRIPTION - FIRE DETECTORS DESCRIPTION

ENGINE FIRE PROTECTION DESCRIPTION (2/3)

Engine Fire-Extinguishing Function/Description

The engine fire-extinguishing system has two primary functions:
- To extinguish a fire in the protected engine zones
- To prevent an engine fire propagation through the isolation of the engine from the fire sources (electrical, fuel, hydraulic, bleed air).

The primary components of the system are:
- Two fire extinguisher bottles for each engine
- The FPF application.

The engine fire-extinguishing system is manually controlled.
To operate the engine fire-extinguishing system, the ENG FIRE P/BSW of the dedicated engine has to be released:
- To arm the cartridge firing system of the bottles
- To isolate the engine from the possible fire sources (electrical, fuel, hydraulic, bleed air).

To discharge the bottles, when the FIRE/ENG 1(2) P/BSW is released, the FIRE/ENG 1(2)/AGENT 1(2) P/BSWs must be pushed to electrically energize the squibs of the bottle cartridges.
The FPF application monitors the pressure of the bottles through the engine CM. If the bottle pressure is low, the CM changes the discrete signal from the bottle pressure switch into a digital signal and sends it to the FPF application.
When a fire operational test is activated from the cockpit, the FPF checks the integrity of the low-pressure indicating system of the bottles and checks the squibs continuity. The engine fire operational test is activated if the FIRE/ENG 1(2) pushbutton switches are not released.
The squibs are electrically energized by HOT BAT bus.

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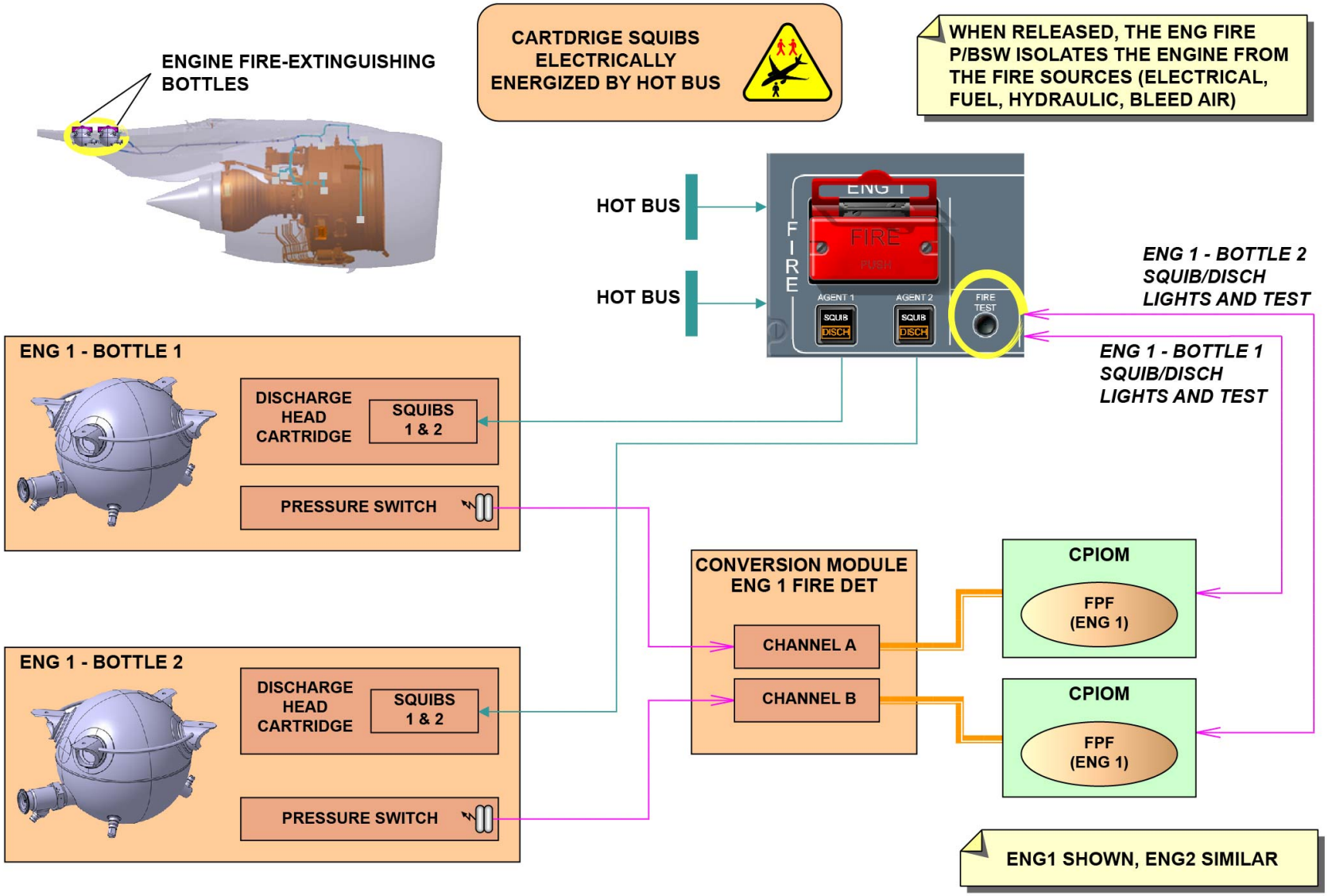

ENGINE FIRE-EXTINGUISHING FUNCTION/DESCRIPTION

V2414251 - V00T0MM0 - VM26D1ENGIN3001

ENGINE FIRE PROTECTION DESCRIPTION (2/3)

Engine Fire-Extinguishing Function/Description (continued)

Fire-extinguisher bottles description

All the engine fire-extinguisher bottles are the same and contain a pressurized extinguishing agent.
Each bottle has:
- Two handles to help the removal or installation
- An outlet rupture disc connected to a discharge head outlet
- A cartridge
- A pressure switch for the monitoring.

The integrity of the pressure switch and the low-pressure signal transmission is manually tested. An ALLEN-key test point is used to do this test.

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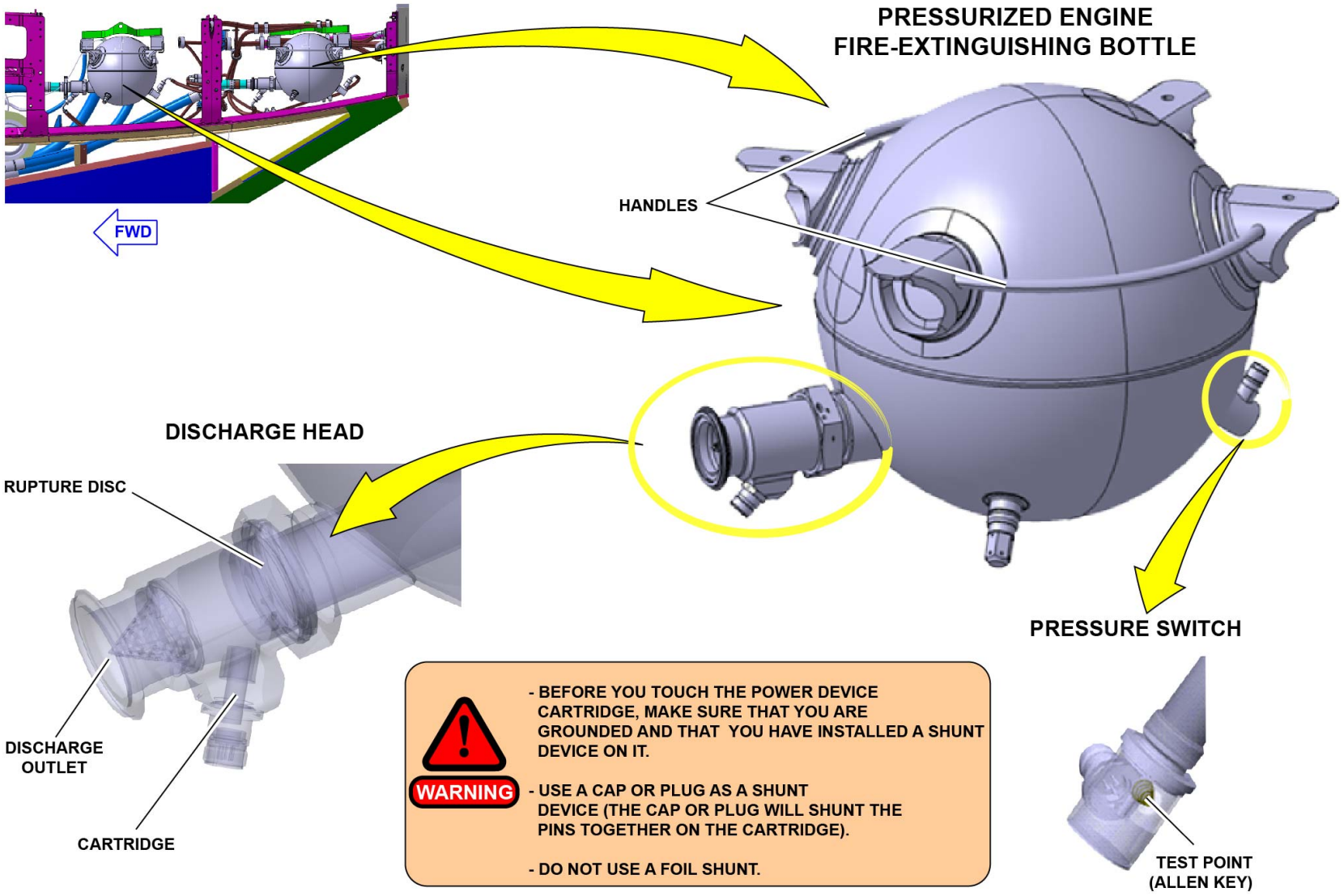

PRESSURIZED ENGINE
FIRE-EXTINGUISHING BOTTLE
FWD
HANDLES
DISCHARGE HEAD
RUPTURE DISC
DISCHARGE
OUTLET
CARTRIDGE
PRESSURE SWITCH
WARNING
- BEFORE YOU TOUCH THE POWER DEVICE CARTRIDGE, MAKE SURE THAT YOU ARE GROUNDED AND THAT YOU HAVE INSTALLED A SHUNT DEVICE ON IT.
- USE A CAP OR PLUG AS A SHUNT DEVICE (THE CAP OR PLUG WILL SHUNT THE PINS TOGETHER ON THE CARTRIDGE).
- DO NOT USE A FOIL SHUNT.
TEST POINT
(ALLEN KEY)

ENGINE FIRE-EXTINGUISHING FUNCTION/DESCRIPTION - FIRE-EXTINGUISHER BOTTLES DESCRIPTION

V2414251 - V00T0MM0 - VM26D1ENGIN3001

APU FIRE PROTECTION DESCRIPTION (2/3)

APU Fire-Protection General Presentation

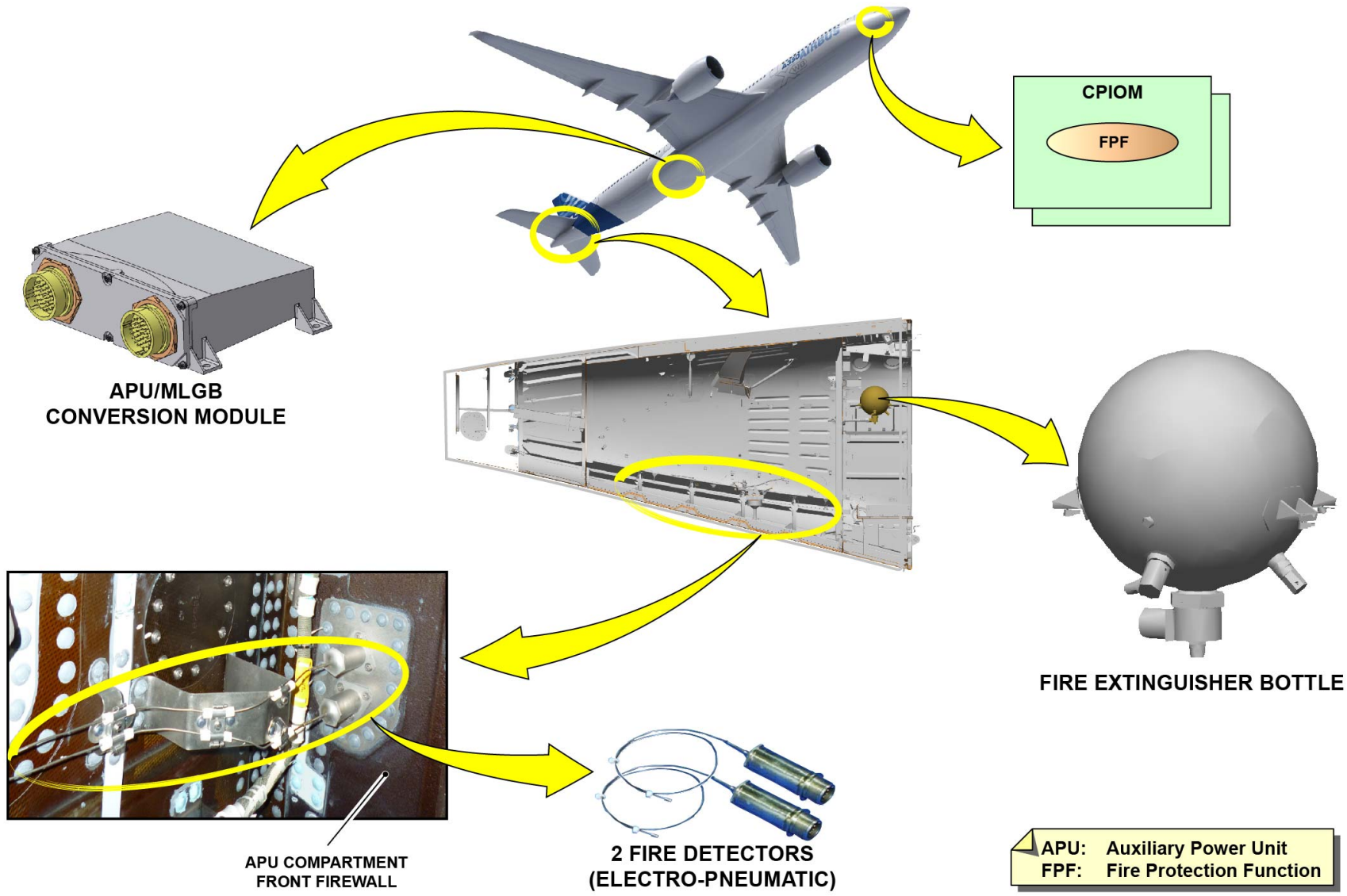
The APU fire-protection system has two subsystems:
- A fire detection subsystem
- A fire extinguishing subsystem.

The fire detection subsystem senses a fire or an overheat condition in the APU area.
The components of the fire protection system are:
- Two APU-compartment fire detectors

The detectors use electro-pneumatic technology. They have the same operating principle as the engine fire detectors.
- One extinguisher bottle
- An APU/Main Landing Gear Bay (MLGB) Conversion Module (CM).

The CM is used for the APU fire detection and also for the MLGB fire detection.
- Fire Protection Function (FPF) applications hosted in two CPIOMs.

V2414251 - V00T0MM0 - VM26D2APUFI3001



APU FIRE-PROTECTION GENERAL PRESENTATION

APU FIRE PROTECTION DESCRIPTION (2/3)

APU Fire-Detection Function/Description

Two redundant fire detectors, corresponding to the loop A and loop B, monitor the APU compartment for fire or overheat. They send analog signals (normal, fire or fault) to the APU/MLGB CM. The APU/MLGB CM changes the analog signals of the detectors into digital signals and sends them to the FPF applications.
When the temperature in the APU compartment gets to a specified threshold, the FPF applications hosted in two CPIOMs give warnings to the crew through the FWS and the cockpit APU/FIRE P/BSW.
The FPF applications trigger the APU fire warnings if:
- The two loops sense a fire or an overheat.
- One loop senses a fire or an overheat and the other loop is failed.

In addition, if a fire or an overheat is sensed on ground (LGERS signal), one FPF application:
- Operates an external horn.
- Illuminates an APU fire warning-light on the Nose Landing Gear (NLG) maintenance panel.

The system operates even if the aircraft is electrically energized only by batteries.
An operational test can be done in flight or on ground through the FIRE TEST P/BSW from the cockpit FIRE control panel. The same FIRE TEST P/BSW does a check of:
- The fire detection system of the APU
- The fire detection system of the engines
- The fire detection system of the MLGB.

A CMS test is used for a resistance and a continuity check of the APU fire detectors.

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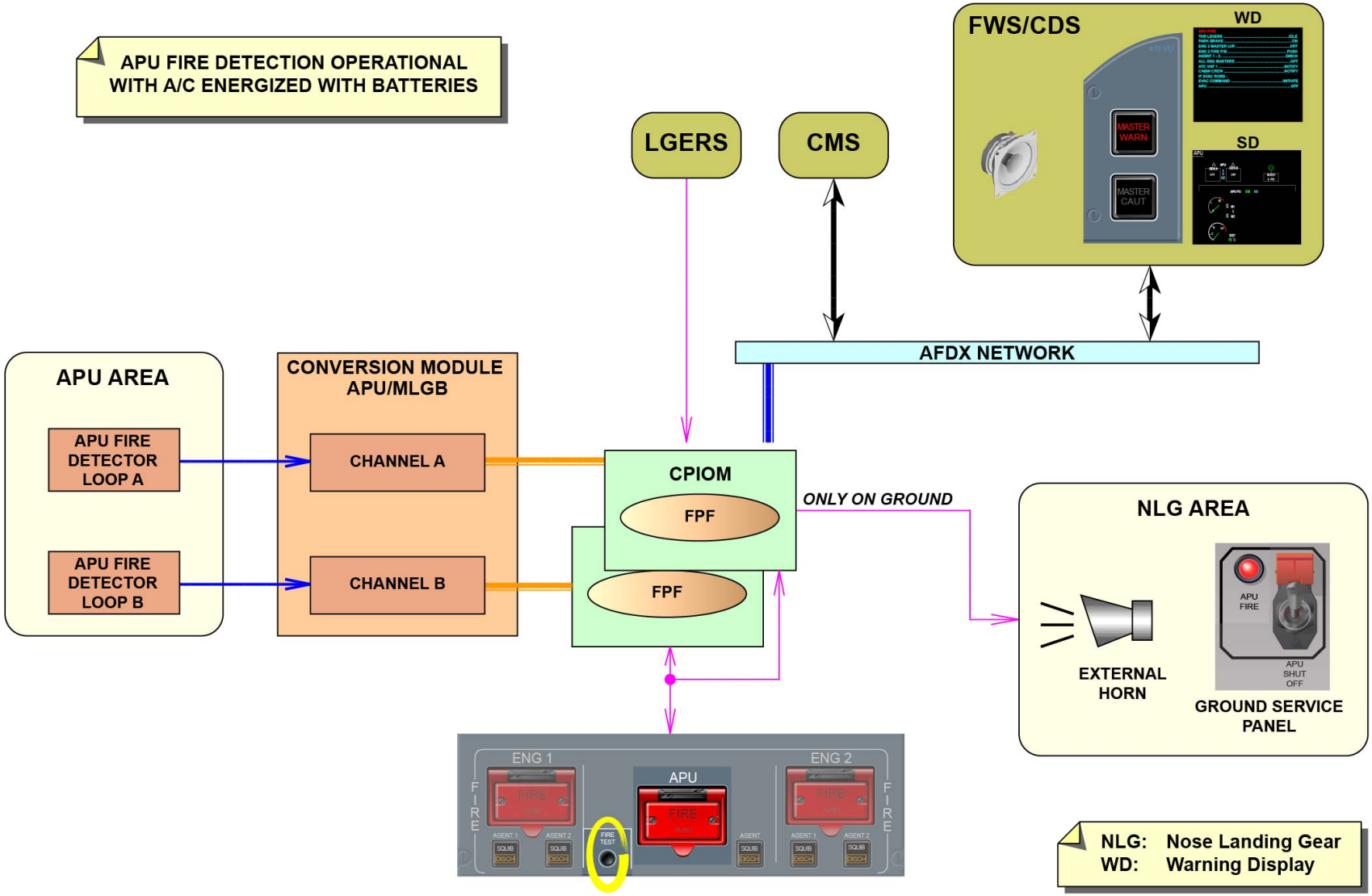

APU FIRE-DETECTION FUNCTION/DESCRIPTION

V2414251 - V00T0MM0 - VM26D2APUFI3001

APU FIRE PROTECTION DESCRIPTION (2/3)

APU Fire-Extinguishing Function/Description

The Fire Extinguishing System (FES) of the APU has two primary functions:
- Stop the APU
- Release the extinguishing agent from the fire extinguisher bottle in the APU compartment.

The primary components of the system are:
- One fire extinguisher bottle
- The FPF application hosted in two CPIOMs.

The APU FES can be manually operated in flight and on ground configurations through the APU/FIRE P/BSW of the cockpit FIRE control panel.
In ground configuration, the APU FES can also be automatically operated through the FPF applications.
When the FIRE/APU P/BSW is pushed, the APU manually stops through emergency relays and the cartridge firing system is armed.
Then when the FIRE/APU/AGENT P/BSW is pushed, the electrical power is supplied to the squibs of the extinguisher bottle cartridge.
When the bottle pressure is low, the pressure switch sends a discrete signal to one FPF application through the APU/MLGB CM which changes it into a digital signal. The FPF application illuminates the DISCH legend of the AGENT P/BSW.
If there is a fire on ground, the FPF applications automatically:
- Stop the APU through emergency relays
- Supply electrical power to the squibs of the APU fire-extinguisher bottle cartridge.

The squibs are electrically energized by a HOT BAT bus.
When a fire operational test is operated through the FIRE control panel, the FPF does a check of:
- The integrity of the low-pressure indicating system of the bottle
- The continuity of the squibs in the cartridge.

The FPF applications monitor the FIRE/APU P/BSW.
In addition to the operational test, there are specific CMS tests for the APU FES.

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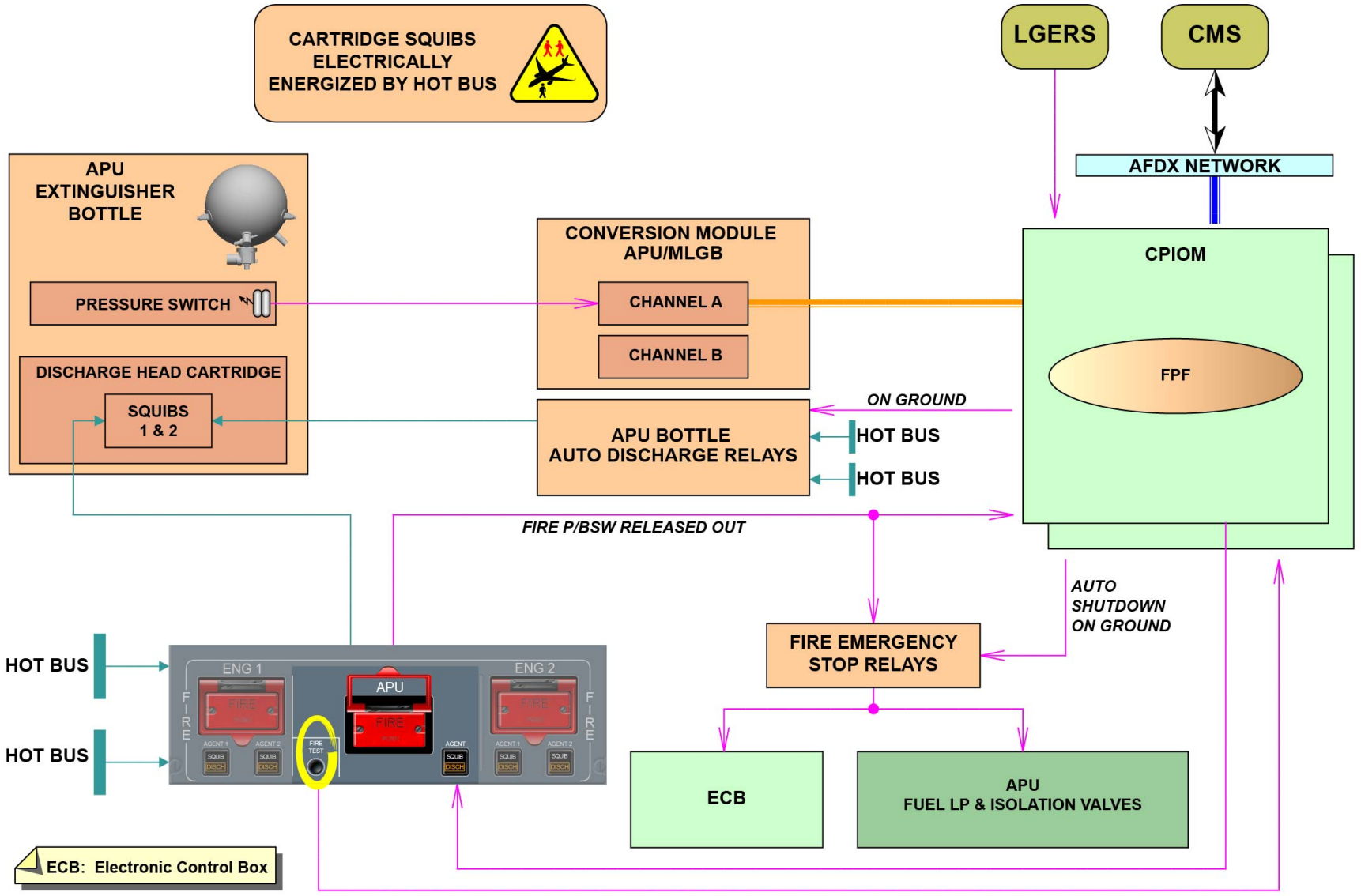


APU FIRE-EXTINGUISHING FUNCTION/DESCRIPTION

V2414251 - V00T0MM0 - VM26D2APUFI3001

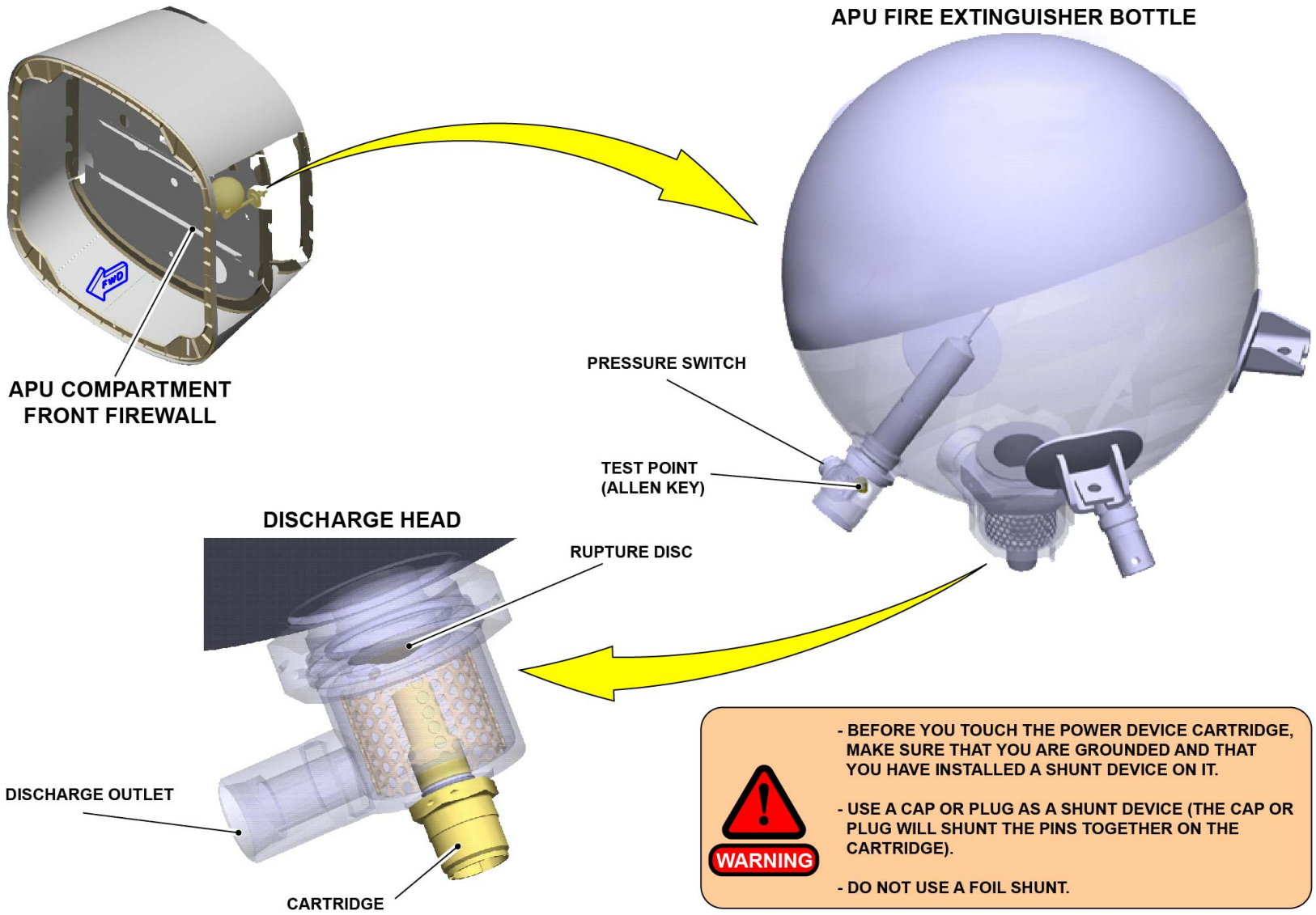
APU FIRE PROTECTION DESCRIPTION (2/3)

APU Fire-Extinguishing Function/Description (continued)

Extinguisher bottle description

The APU fire-extinguisher bottle contains a pressurized extinguishing agent.
The bottle has a rupture disc connected to a discharge head outlet, a cartridge and a pressure switch.
The integrity of the pressure switch and the transmission of the low pressure signal can be tested manually. An ALLEN-key test point is used to do this test.

V2414251 - V00T0MM0 - VM26D2APUFI3001


APU FIRE EXTINGUISHER BOTTLE
APU COMPARTMENT
FRONT FIREWALL
FWD
PRESSURE SWITCH
TEST POINT
(ALLEN KEY)
DISCHARGE HEAD
RUPTURE DISC
DISCHARGE OUTLET
CARTRIDGE
WARNING
- BEFORE YOU TOUCH THE POWER DEVICE CARTRIDGE, MAKE SURE THAT YOU ARE GROUNDED AND THAT YOU HAVE INSTALLED A SHUNT DEVICE ON IT.
- USE A CAP OR PLUG AS A SHUNT DEVICE (THE CAP OR PLUG WILL SHUNT THE PINS TOGETHER ON THE CARTRIDGE).
- DO NOT USE A FOIL SHUNT.

APU FIRE-EXTINGUISHING FUNCTION/DESCRIPTION - EXTINGUISHER BOTTLE DESCRIPTION

MAIN LANDING GEAR FIRE DETECTION DESCRIPTION (2/3)

General Presentation

The Main Landing Gear (MLG) fire-detection system is used to monitor a fire or an overheat in the Main Landing Gear Bay (MLGB).
Two zones of the MLGB are monitored:
- The right side
- The left side.

The system components are:
- Four fire detectors, one pair on each side of the MLGB.

The MLGB fire-detectors are electro-pneumatic detectors. They have the same operating principle as the engine fire detectors.
- An APU/MLGB Conversion Module (CM).

The CM is used for the MLGB fire detection and also for the APU fire detection.
- A Fire Protection Function (FPF) application hosted in two CPIOMs.

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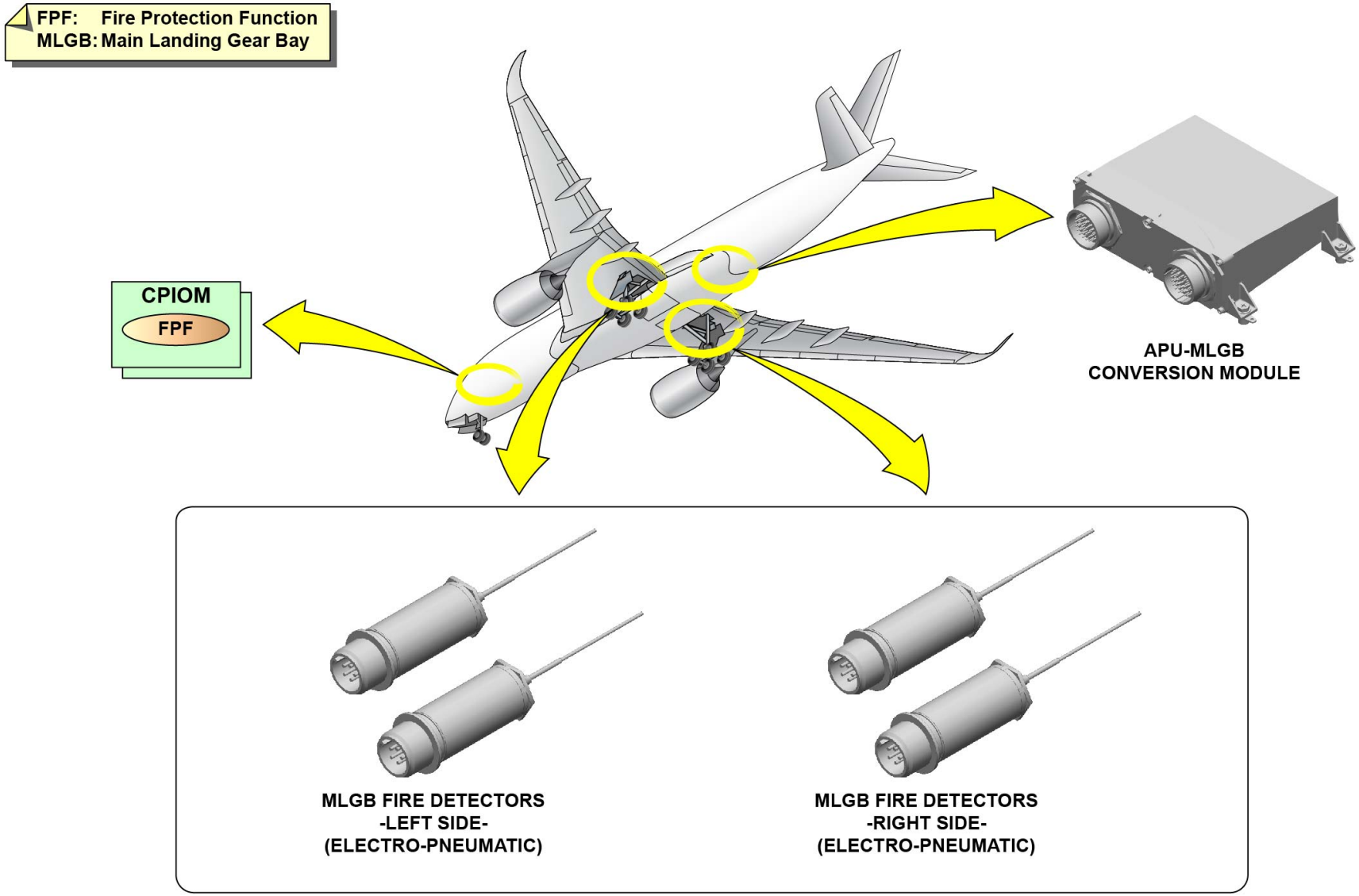

GENERAL PRESENTATION

MAIN LANDING GEAR FIRE DETECTION DESCRIPTION (2/3)

Function/Description

For each MLGB side, two fire detectors are installed:
- One is part of a loop A
- The other is part of a loop B.

Each loop, related to two detectors, is connected to a related channel in the APU/MLGB CM. Each loop sends analog signals (normal, fire or fault) to the APU/MLGB CM.
The APU/MLGB CM:
- Changes the analog signals of the MLG fire detectors into digital signals
- Sends them to the FPF application.

The FPF application hosted in two CPIOMs sends warnings to the crew through the FWS and a cockpit MLGB FIRE light.
The FPF application sends the MLGB fire warnings if:
- The two loops detect a fire or an overheat
- One loop detects a fire or an overheat and the other loop is defective.

An operational test can be done through the TEST P/BSW on the cockpit FIRE control panel. The fire detection of the MLGB but also the fire detection of the engines and the APU are tested in the same time.
A CMS test is used for a resistance and a continuity check of the MLGB fire detectors.

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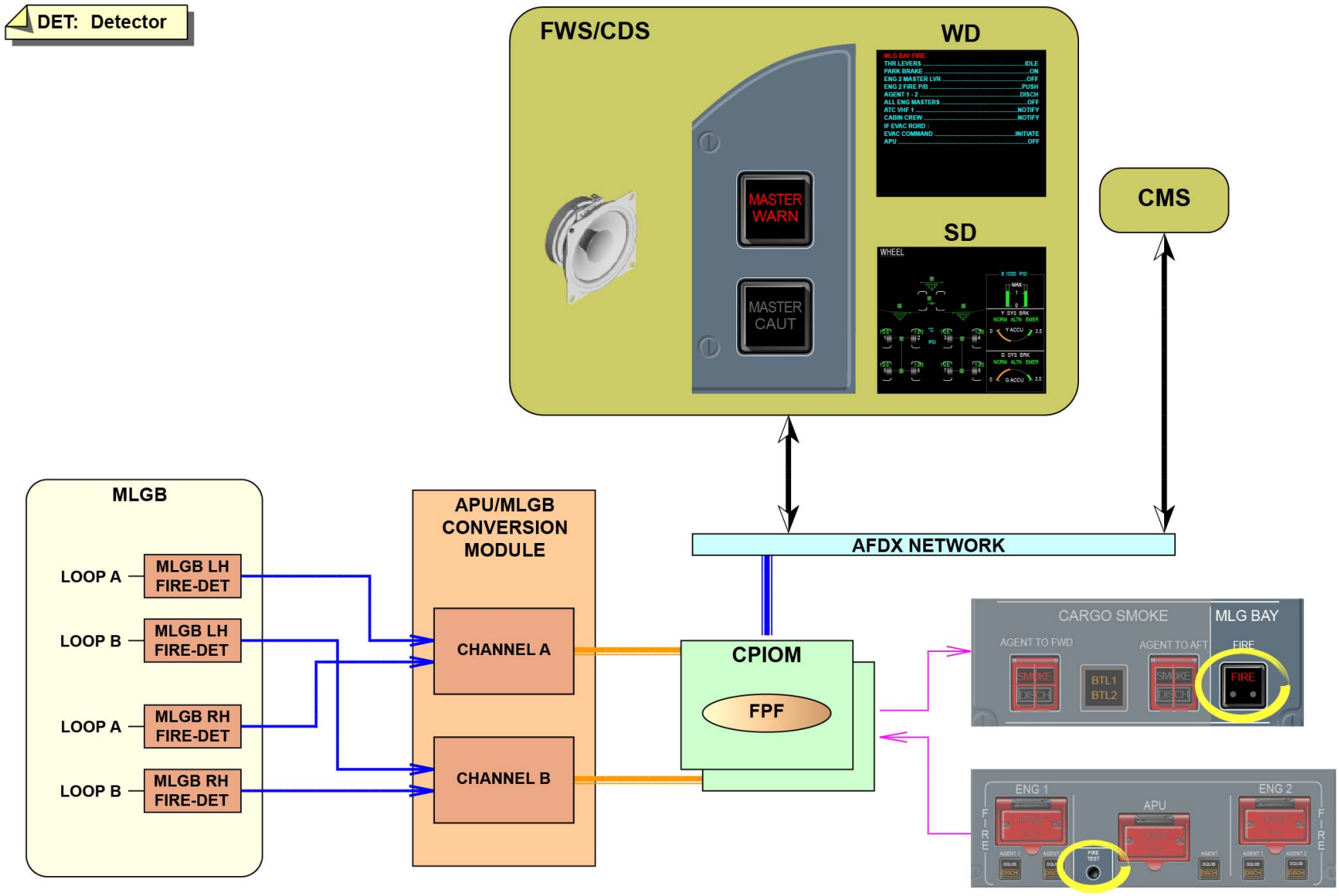

FUNCTION/DESCRIPTION

FIRE PROTECTION SYSTEM CONTROL AND INDICATING (2/3)

Fire Protection System - General (2)

In case of an Engine, APU or Main Landing Gear (MLG) bay fire detection, the related ECAM SD page is displayed associated with cockpit indications on:
- FIRE panel,
- MLG BAY panel,
- ENG MASTER SWITCHES,
- Attention Getters panels (MASTER WARNING lights).

On ground, in case of APU fire detection, there is also a dedicated indication on the Nose Landing Gear (NLG) ground service panel.
Activation of the fire extinguishing system for engines and APU is done from the FIRE panel on the overhead panel.

Fire Protection System Operational Test (2)

A cockpit FIRE TEST P/B is used to test the fire detection and extinguishing system for the ENGINES, APU and MLG BAY.
NOTE: There is no fire extinguishing system for the MLG BAY.
The operation of the FIRE TEST P/B checks the condition of following items:
- The fire detectors (loop A & B), the conversion modules (CMs), the CPIOMs FPF applications,
- The fire indication lights and warning messages,
- The fire extinguisher bottles DISCH lights and related wirings,
- The fire extinguisher bottles SQUIB lights with the cartridges filaments continuity and the related wirings.

When the operational TEST P/B is pressed and hold :
- On the ENG and APU FIRE PB switches, the red lamps illuminate.
- On the ENG and APU AGENT buttons: the SQUIB white light and the amber DISCH light illuminate.
- On the MLG BAY panel, the red FIRE light illuminates.
- On the ENG MASTER switches, the red FIRE light illuminates.
- MASTER WARNING red lights illuminate and a Continuous Repetitive Chime (CRC) is triggered.
- On the WD, the Warning messages concerning ENG, APU and MLG BAY fire are displayed with the associated procedures.
- On the SD: the ENGINE system page is displayed.
- On the NLG ground service panel, the red APU FIRE light illuminates.
- By pressing four times the MASTER WARNING light on the glareshield, the CRC is cancelled.
- By selecting the ECAM CLEAR key, the SD page changes from ENGINE page to APU page and WHEEL page.

Engine Fire Detection Fault (3)

FIRE DETECTION SINGLE LOOP FAILURE
In case of failure of one detection loop for an engine (or APU or the MLG BAY), a SINGLE FIRE LOOP FAULT message is displayed on the ECAM DISPATCH page.
The FIRE warning message and other FIRE indications for the concerned engine (or APU or the MLG BAY) are normally illuminated when Fire Push To Test P/B is pressed and hold.
FIRE DETECTION DUAL LOOP FAILURE
In case of loss of both fire detection loops (Loop A and Loop B) for an engine (or APU or the MLG BAY), a FIRE DET FAULT message is displayed on the WD, Master Caution lights come ON and a Single Chime (SC) is triggered.
The FIRE warning message and other FIRE indications for the concerned engine (or APU or the MLG BAY) are not illuminated when the Fire Push To Test P/B is pressed and hold.

ENGINE FIRE Warning on Ground (3)

After FIRE detection in an engine zone, the corresponding cockpit FIRE indications are triggered with an associated WD message.

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The crew has to shutdown the engine by selecting the engine master switch to off and to isolate the engine by releasing out the Fire Pushbutton.
When the Fire Pushbutton is released out, the Agent P/B SQUIB lights are illuminated. The extinguishing system is then armed.
Once the Fire Pushbutton is released out, the bottle(s) discharge is possible by pushing the corresponding Agent(s) P/B.
When the Agent P/B is(are) pushed and the bottle(s) is (are) discharged, the Agent P/B DISCH Light(s) illuminate(s).

APU FIRE Warning on Ground (3)

After FIRE detection in the APU area, the corresponding cockpit FIRE indications are triggered with an associated WD message.
Additionally, on ground:
- The fire warning light illuminates on the NLG Ground Service Panel.
- The mechanical call horn is activated (external horn is cancelled by selecting the APU SHUT OFF Switch on the nose gear panel or automatically when there is no more APU fire detection).

In flight or on ground with somebody in the cockpit, the crew has to isolate the APU by releasing out the Fire Pushbutton.
When the Fire Pushbutton is released out, the Agent P/B SQUIB light is illuminated and the extinguishing system is then armed.
Once the Fire Pushbutton is released out, the bottle discharge is possible by pushing the corresponding Agent P/B.
When the Agent P/B is pushed and the bottle is discharged, the Agent P/B DISCH Light illuminates.
On ground, If no action is performed from the cockpit the APU automatic shutdown and automatic extinguishing functions will be activated.

MLG FIRE Warning on Ground (3)

After FIRE detection in the Main Landing Gear Bay (MLGB) zone, following fire alarms are displayed in the cockpit:
- the Master Warning lights illuminate with the associated CRC,
- The MLG BAY FIRE warning message appears on the WD,
- The MLG BAY FIRE indicator light illuminates.

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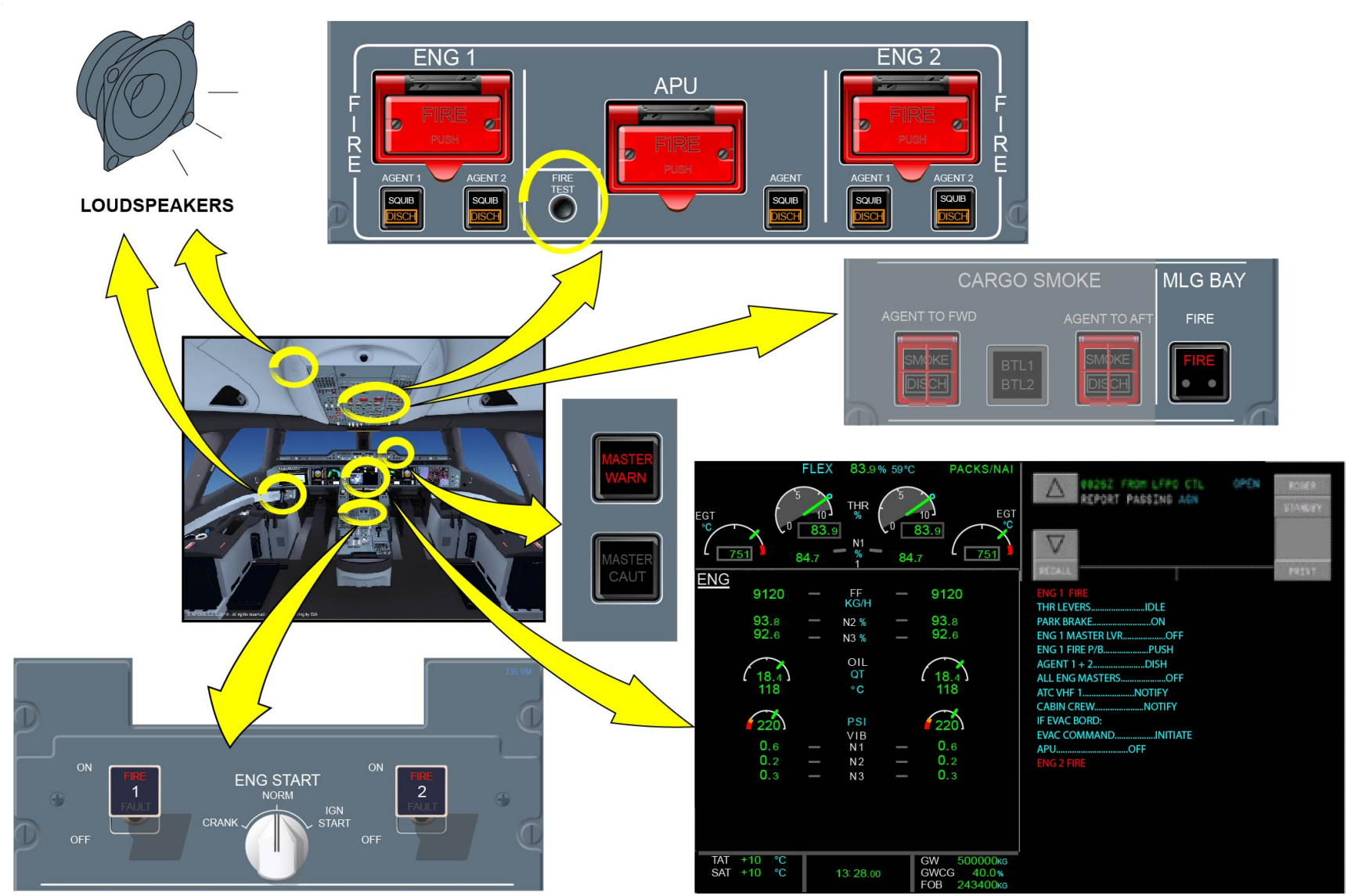
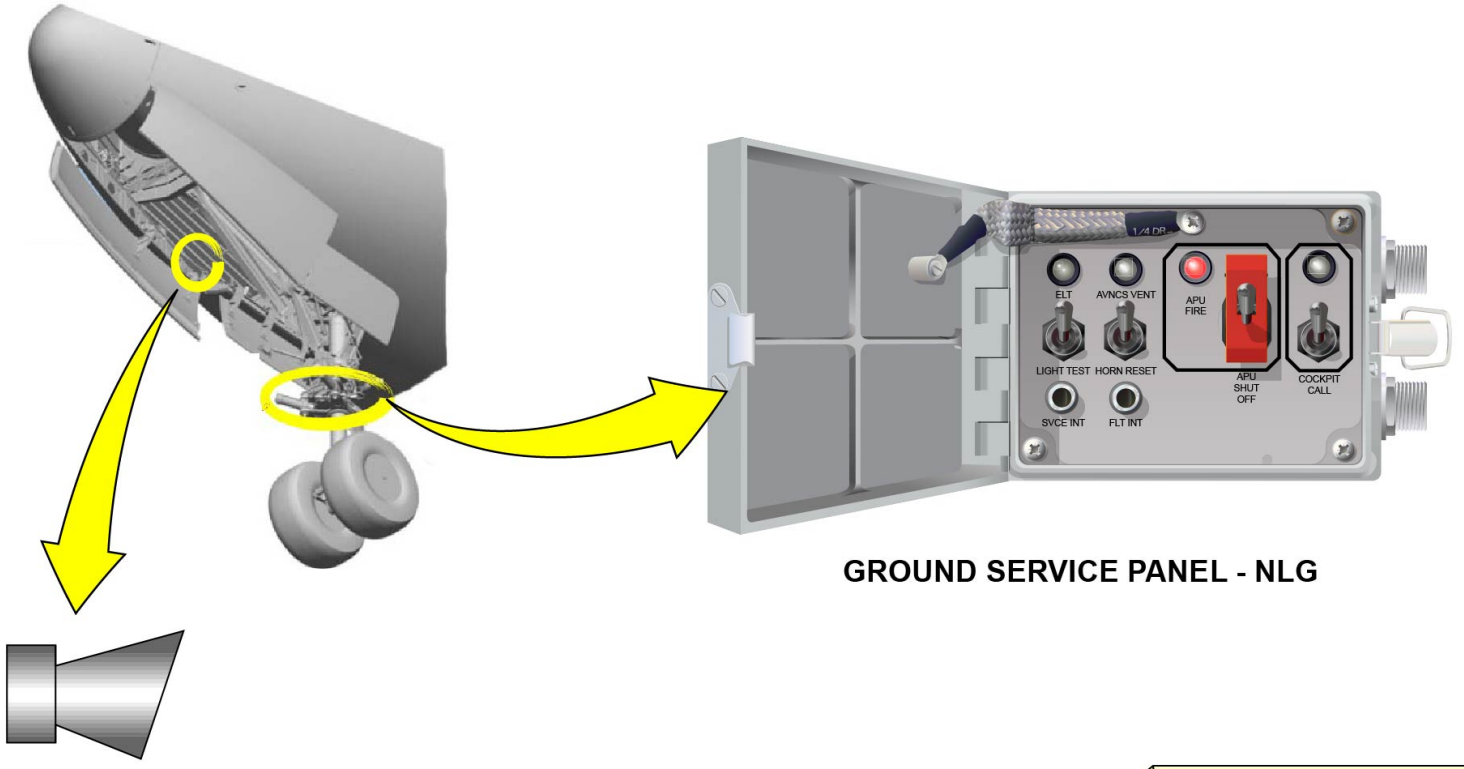


FIRE PROTECTION SYSTEM - GENERAL (2) ... MLG FIRE WARNING ON GROUND (3)

ONLY ON GROUND IN CASE OF OPERATIONAL FIRE TEST OR APU FIRE DETECTION

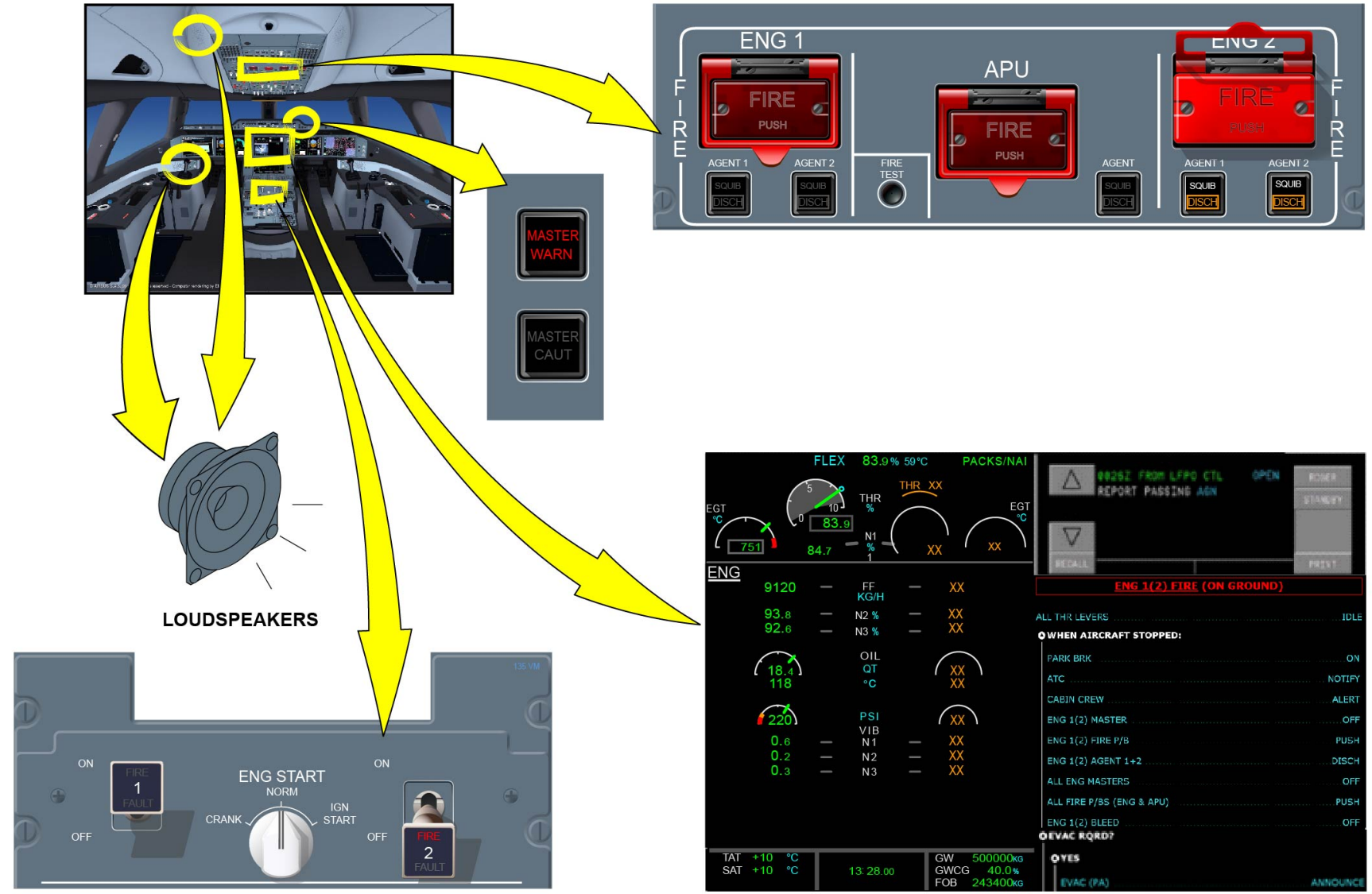


GROUND SERVICE PANEL - NLG

MECHANICAL HORN

NLG: Nose Landing Gear

FIRE PROTECTION SYSTEM - GENERAL (2) ... MLG FIRE WARNING ON GROUND (3)



FIRE PROTECTION SYSTEM - GENERAL (2) ... MLG FIRE WARNING ON GROUND (3)

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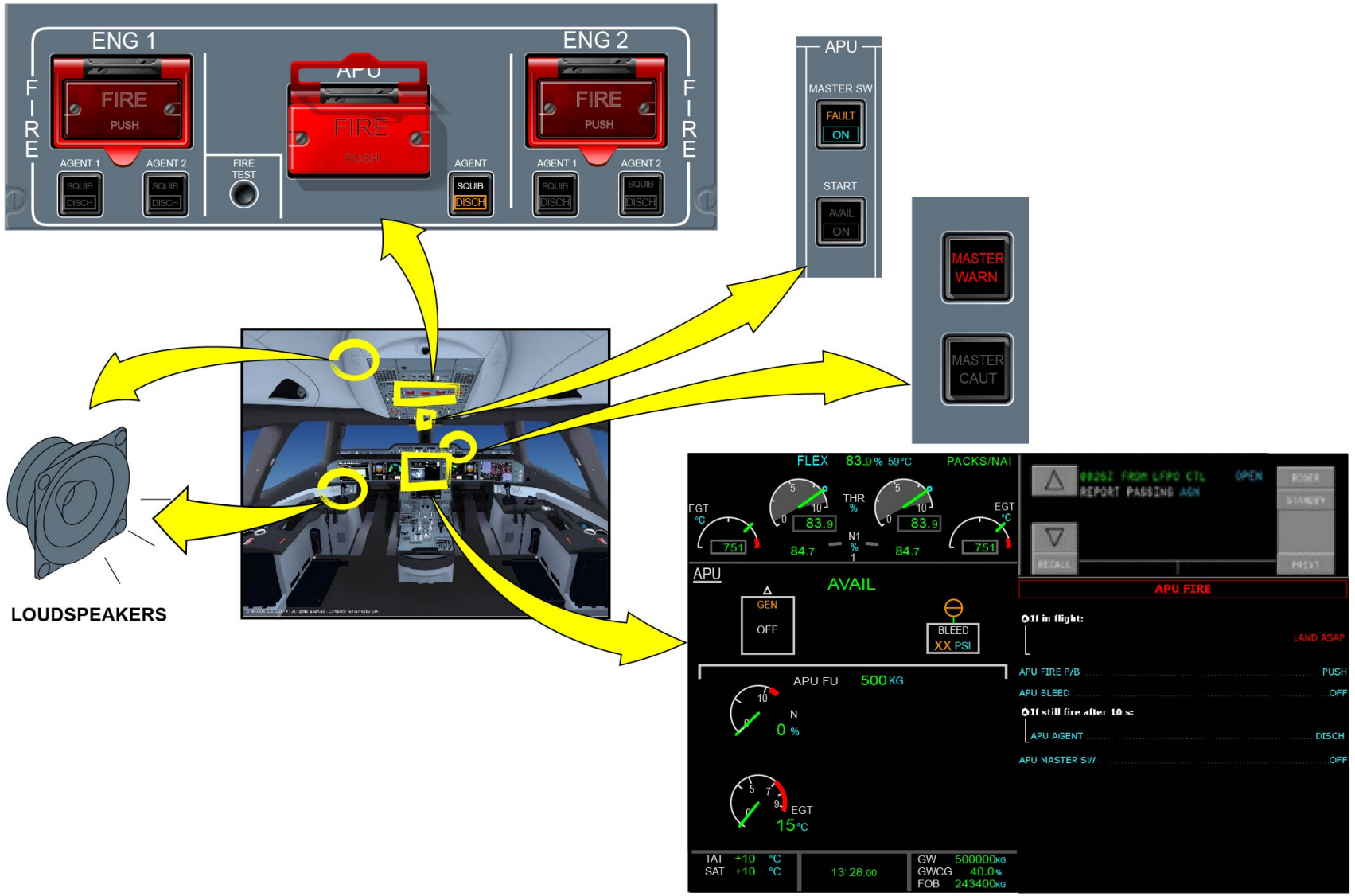
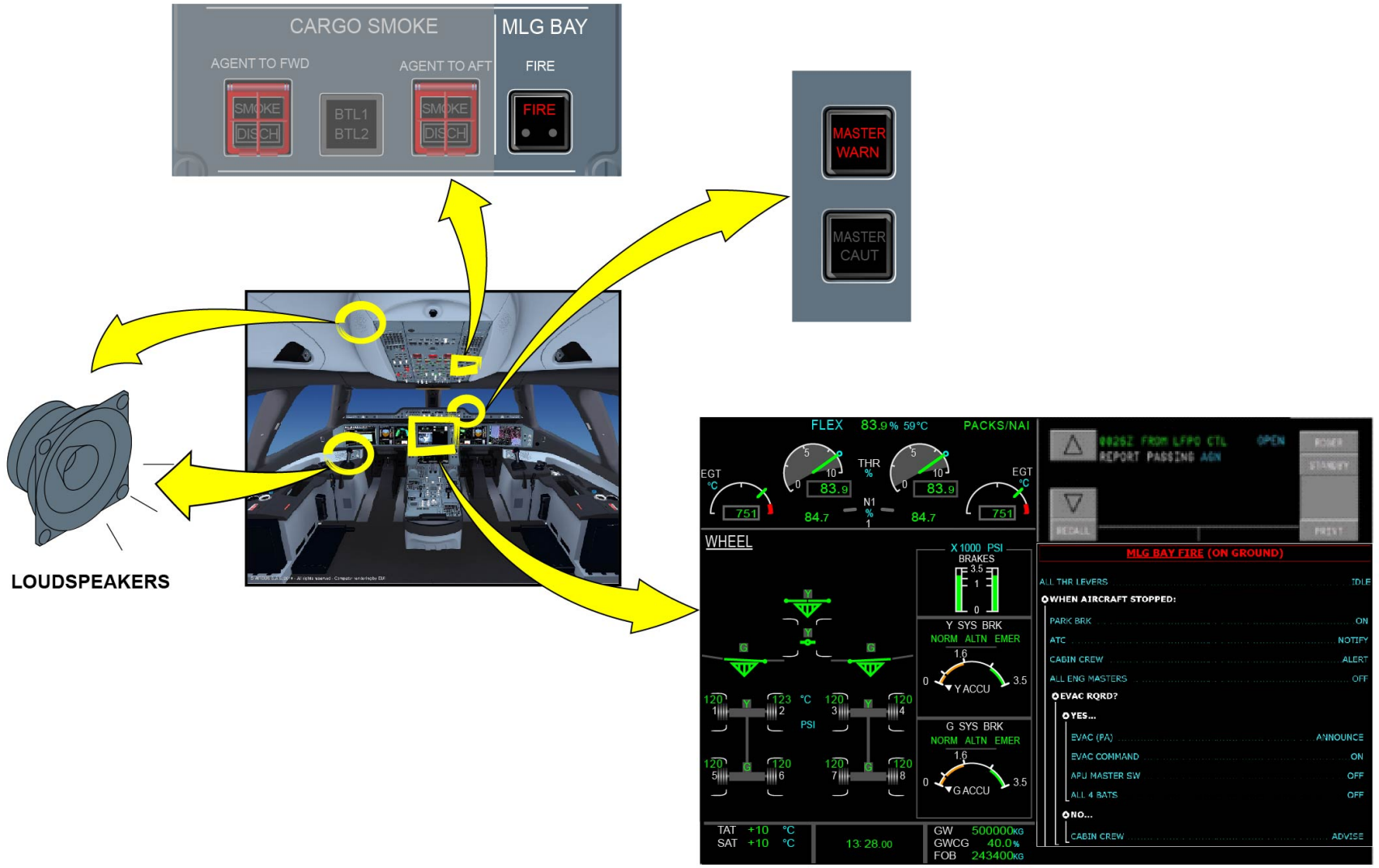


FIRE PROTECTION SYSTEM - GENERAL (2) ... MLG FIRE WARNING ON GROUND (3)



FIRE PROTECTION SYSTEM - GENERAL (2) ... MLG FIRE WARNING ON GROUND (3)

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CABIN AND LAVATORIES FIRE PROTECTION DESCRIPTION (2/3)

Smoke Detection Function/Description

A Smoke Detection System (SDS) is installed in:
- The lavatories
- The Cabin Crew Rest Compartment (CCRC) if the option is installed
- The Flight Crew Rest Compartment (FCRC) if the option is installed.

The cabin and lavatories SDS functions are:
- To monitor these customized and non customized areas for smoke occurrence
- To send related warnings to the cockpit and to the cabin.

The primary components of the SDS of the cabin and lavatories are:
- Smoke detectors
- The CIDS/Smoke Detection Function (SDF).

Components function/description

Smoke detectors

One smoke detector is installed in each lavatory and several smoke detectors are installed in the CCRC and FCRC.

The smoke detectors are ambient type detectors. They are used for closed areas.

For the CCRC and FCRC, the smoke detectors are directly connected to the CIDS/SDF.

For the lavatories, which can be installed in flexible zones, the smoke detectors are connected to the CIDS/SDF through the Decoder/Encoder Unit (DEU)-Bs.

The DEU-Bs:
- Supply the electrical power to the lavatory smoke detectors
- Make the communication between the lavatory smoke detectors and the SDF.

CIDS/SDF

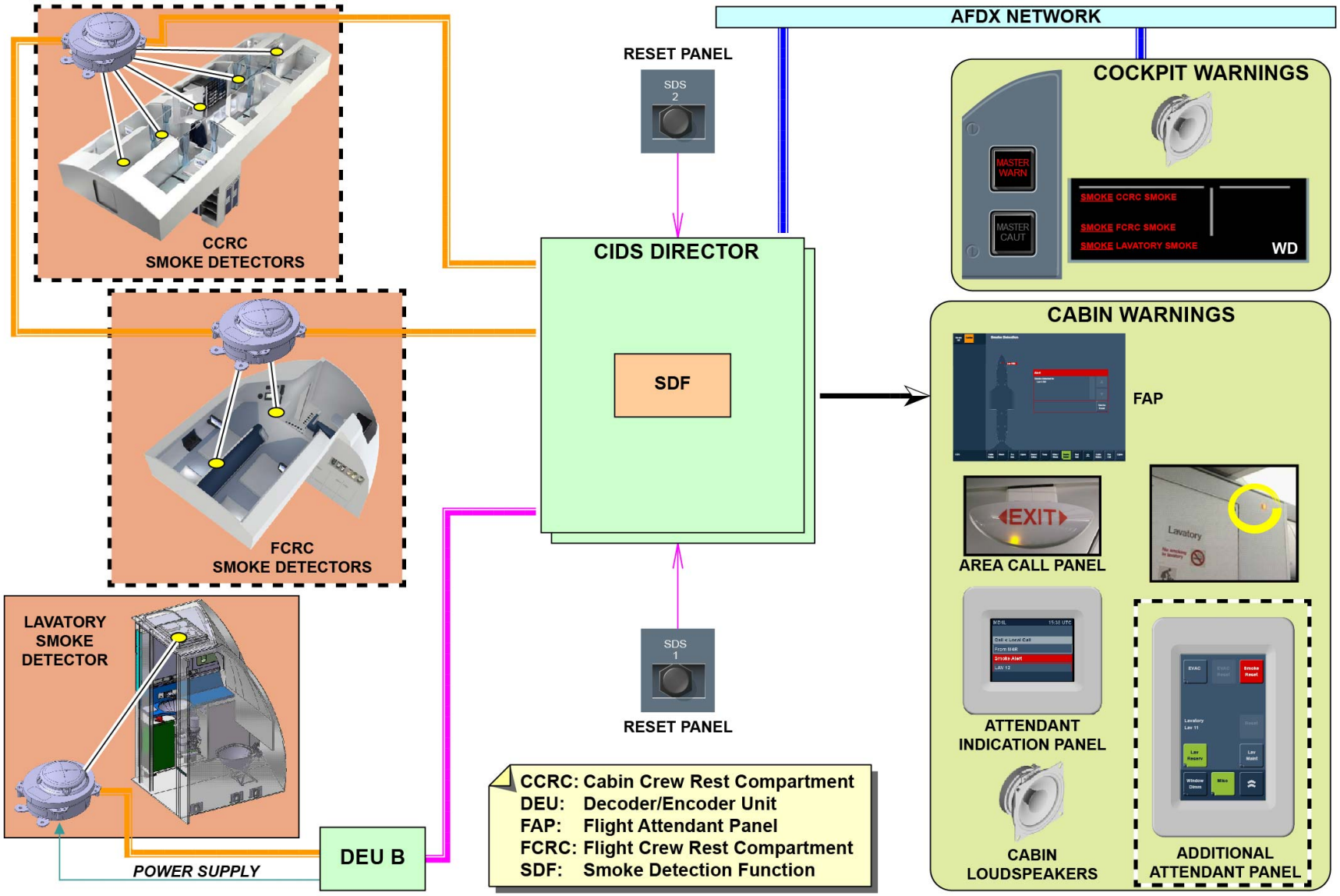
For redundancy, there are two SDF partitions, one inside each CIDS director. By default, the SDF in CIDS1 is active and the other is in standby.

The CIDS/SDF:
- Receives the signals from the smoke detectors
- Monitors the status (operative or inoperative) of the detectors.

If a lavatory detector or one of the detectors of the CCRC or FCRC detects smoke, the CIDS/SDF sends the cockpit and cabin warnings which include the display of a smoke detection page on the FAP.

The CIDS/SDF can be reset by reset switches.

V2414251 - V00T0MM0 - VM26D4CABLA3001



SMOKE DETECTION FUNCTION/DESCRIPTION - COMPONENTS FUNCTION/DESCRIPTION

V2414251 - V00T0MM0 - VM26D4CABLA3001

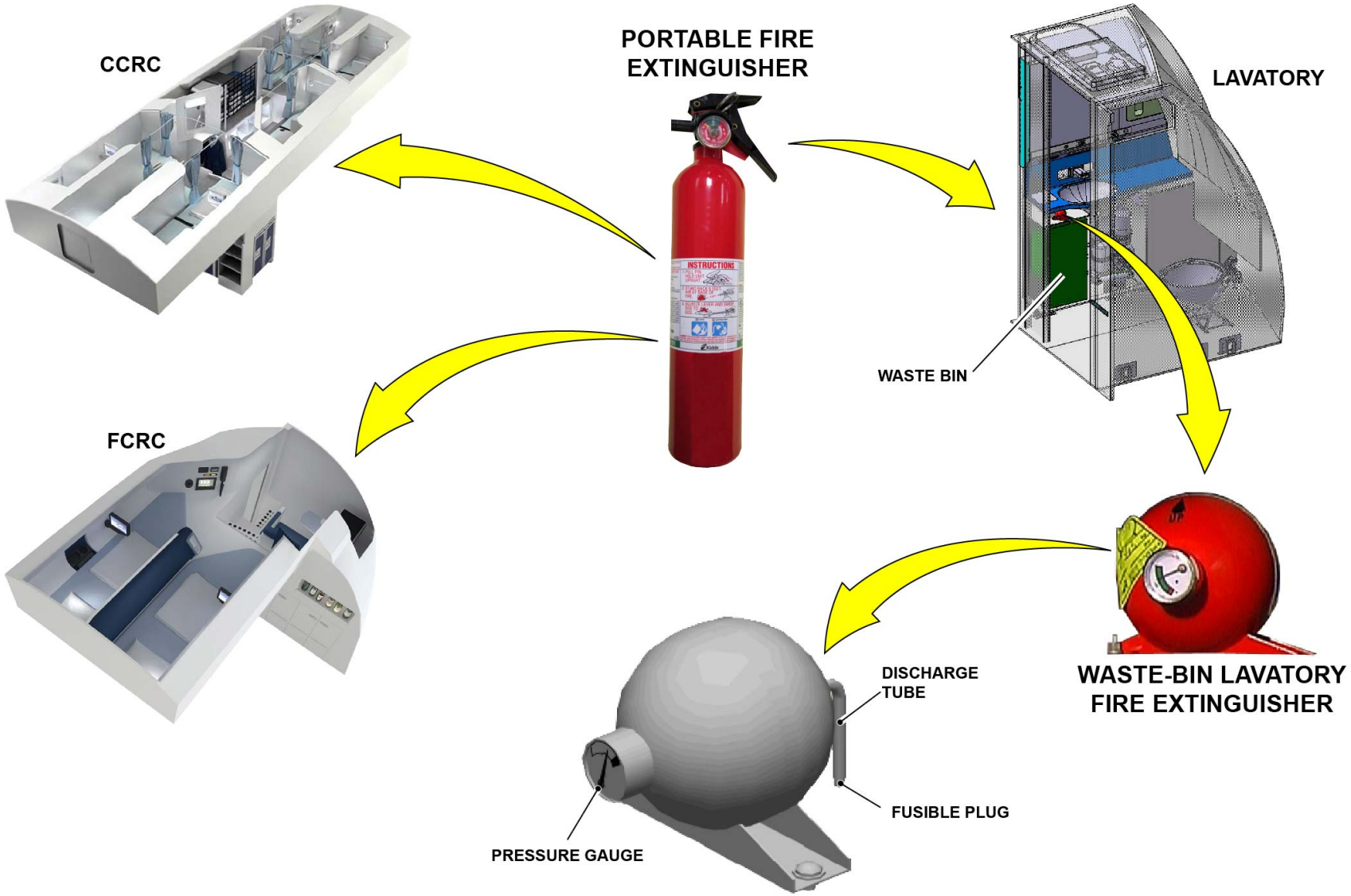
CABIN AND LAVATORIES FIRE PROTECTION DESCRIPTION (2/3)

Fire Extinguishing Function/Description

The cabin and lavatory Fire Extinguishing System (FES) has:
- Portable fire-extinguisher bottles
- Fire extinguisher bottles for the waste bin of the lavatories.

The portable fire-extinguisher bottles contain the pressurized extinguishing agent and are used if there is a fire in the cabin, which includes the CCRC, FCRC and the lavatories.
A fire extinguisher bottle is installed above the waste bin in each lavatory.
If a fire occurs in the waste bin, the fire extinguisher bottle is automatically discharged thanks to a fusible plug which melts.
If there is smoke in a lavatory, but out of the waste bin, the cabin crew uses the portable fire-extinguisher bottles from the cabin.
The bottle has a pressure gauge with a needle which shows if the bottle is charged or empty.

V2414251 - V00T0MM0 - VM26D4CABLA3001



FIRE EXTINGUISHING FUNCTION/DESCRIPTION

V2414251 - V00T0MM0 - VM26D4CABLA3001

CARGO FIRE PROTECTION DESCRIPTION (2/3)

Smoke Detection Function/Description

The functions of the Smoke Detection System (SDS) of the cargo compartments are:
- To monitor the FWD and aft/bulk cargo compartments for the occurrence of smoke
- To send warnings to the cockpit.

The primary components of the system are:
- Smoke detectors
- CIDS/Smoke Detection Function (SDF).

Components function/description

Smoke detectors

For each cargo compartment, there are pairs of smoke detectors.

Smoke detectors are ambient type detectors. They are used for closed areas.

Smoke particles go into an opening in the housing of the ambient-type smoke detectors which send a smoke signal to the CIDS/SDF.

CIDS/SDF

For redundancy, there are two SDF partitions, one in each CIDS director.

By default, the SDF in CIDS1 is active and the other SDF in CIDS2 is in standby.

The CIDS/SDF receives the smoke signals from the cargo smoke detectors and monitors the status (operative or inoperative) of the detectors.

The CIDS/SDF sends a cargo smoke signal if:
- A minimum of two detectors in a same cargo compartment detect smoke.

Or
- For a pair of detectors, one detector is inoperative and the other operative detector detects a smoke.

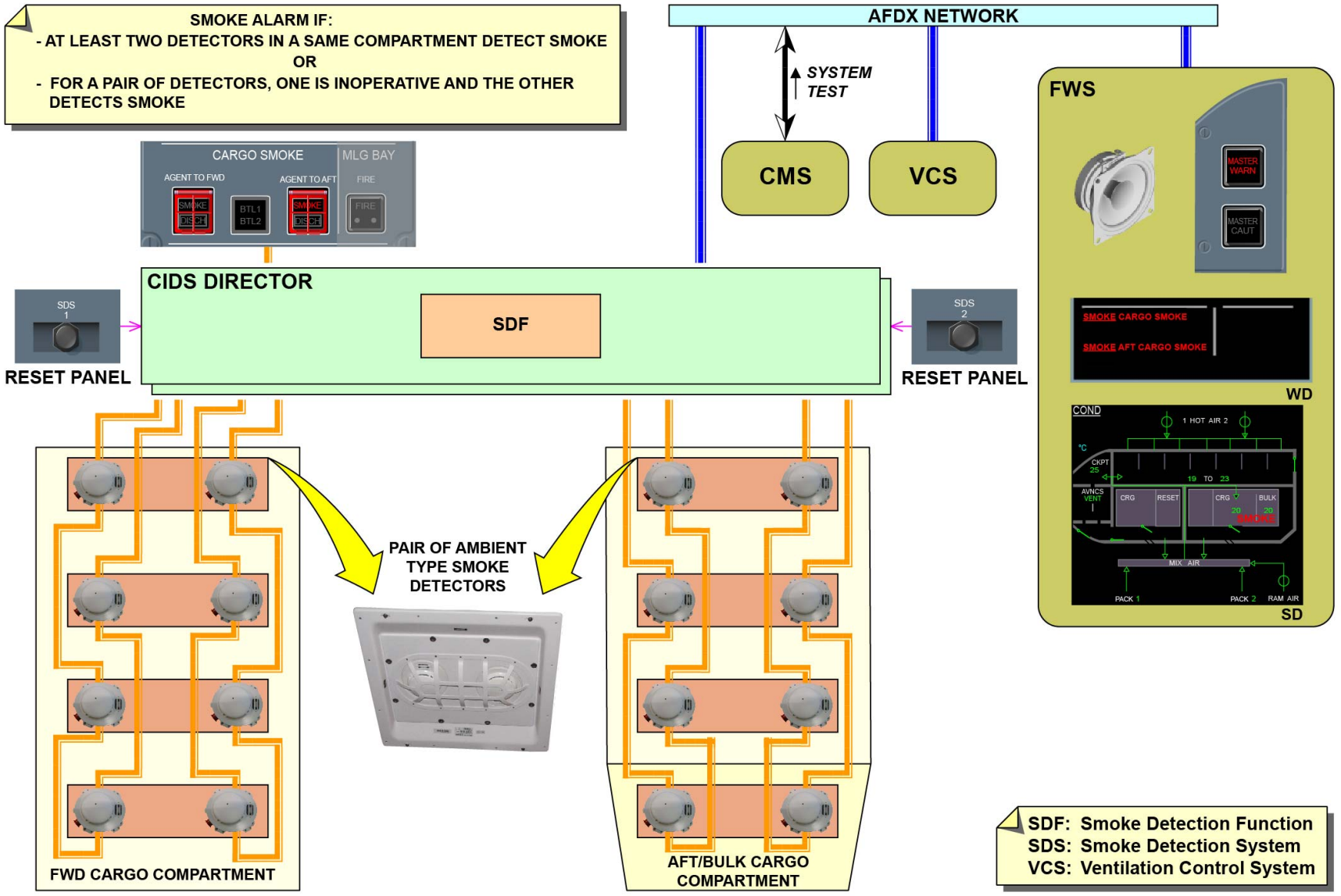
The CIDS/SDF transmits the warnings and fault indications to the FWS and to the CMS.

If there is smoke, a signal is also sent to:
- The cockpit CARGO SMOKE panel: the smoke legend of the AGENT TO FWD (or AGENT TO AFT) pushbutton switch comes on red.
- The Ventilation Control System (VCS) to stop the ventilation of the related compartment.

A CMS interface with the CIDS/SDF is used to do a system test of the cargo SDS (there is no test pushbutton in the cockpit).

Related reset switches can do a reset of the CIDS/SDF.

V2414251 - V00T0MM0 - VM26D5CARGO3001



SMOKE DETECTION FUNCTION/DESCRIPTION - COMPONENTS FUNCTION/DESCRIPTION

V2414251 - V00T0MM0 - VM26D5CARGO3001

CARGO FIRE PROTECTION DESCRIPTION (2/3)

Fire Extinguishing Function/Description

The cargo Fire Extinguishing System (FES) extinguishes fire in the FWD or in the aft/bulk cargo compartments so that the flight can be continued safely until the end of the flight.
The primary components of the cargo FES are:
- A high-rated fire-extinguisher bottle (bottle 1)
- A flow-metered fire-extinguisher bottle (bottle 2)
- A Flow Metering Equipment (FME)
- A diverter valve
- Two Fire Extinguishing Data Converters (FEDCs)
- The CIDS/SDF.

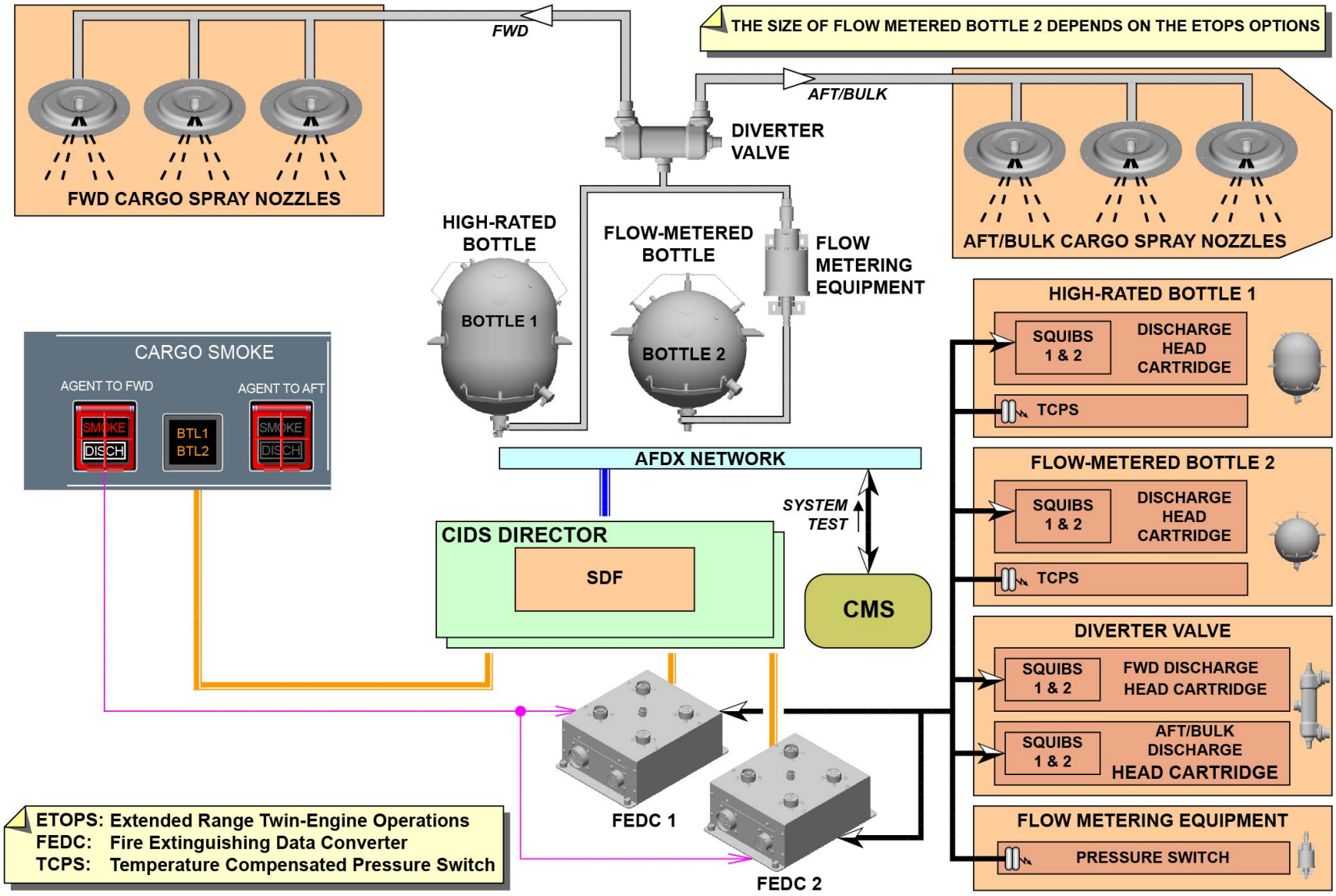
Components function

There are two cargo fire-extinguisher bottles:
- The bottle 1 is a high-rated fire-extinguisher bottle. All its agent is quickly released into the related compartment through the spray nozzles to stop the fire or the smoke source.
- The bottle 2 is a flow-metered fire-extinguisher bottle. It continues to suppress the fire or the smoke source by releasing its agent slowly to keep the agent concentration. The size of flow-metered bottle 2 is different in relation to Extended Range Operations for Two-Engine Aeroplanes (ETOPS).

The Flow Metering Equipment (FME) controls the outflow of the flow-metered fire-extinguisher bottle (bottle 2) and keeps the minimum extinguishing agent concentration over the necessary time.
The diverter valve supplies the extinguishing agent from the two bottles to the FWD or the aft/bulk cargo compartment.
Through the AGENT TO FWD or AGENT TO AFT P/BSW in the cockpit, the two FEDCs electrically energize:
- The squibs of the cartridges of the two cargo extinguisher bottles
- The squibs of the FWD or aft cartridges of the diverter valve.

The FEDCs are also used as a remote data concentrator. They monitor the fire extinguishing system (bottle pressure, squib continuity, correct discharge process of the flow metered bottle).
The CIDS/SDF is an interface between the FEDCs and the CMS to do a cargo fire-extinguishing test.
It shows the indications of the extinguisher bottles discharge (BTL1, BTL2) on the cockpit CARGO SMOKE panel when it receives a bottle low-pressure signal from the FEDCs.

V2414251 - V00T0MM0 - VM26D5CARGO3001



FIRE EXTINGUISHING FUNCTION/DESCRIPTION - COMPONENTS FUNCTION

V2414251 - V00T0MM0 - VM26D5CARGO3001

CARGO FIRE PROTECTION DESCRIPTION (2/3)

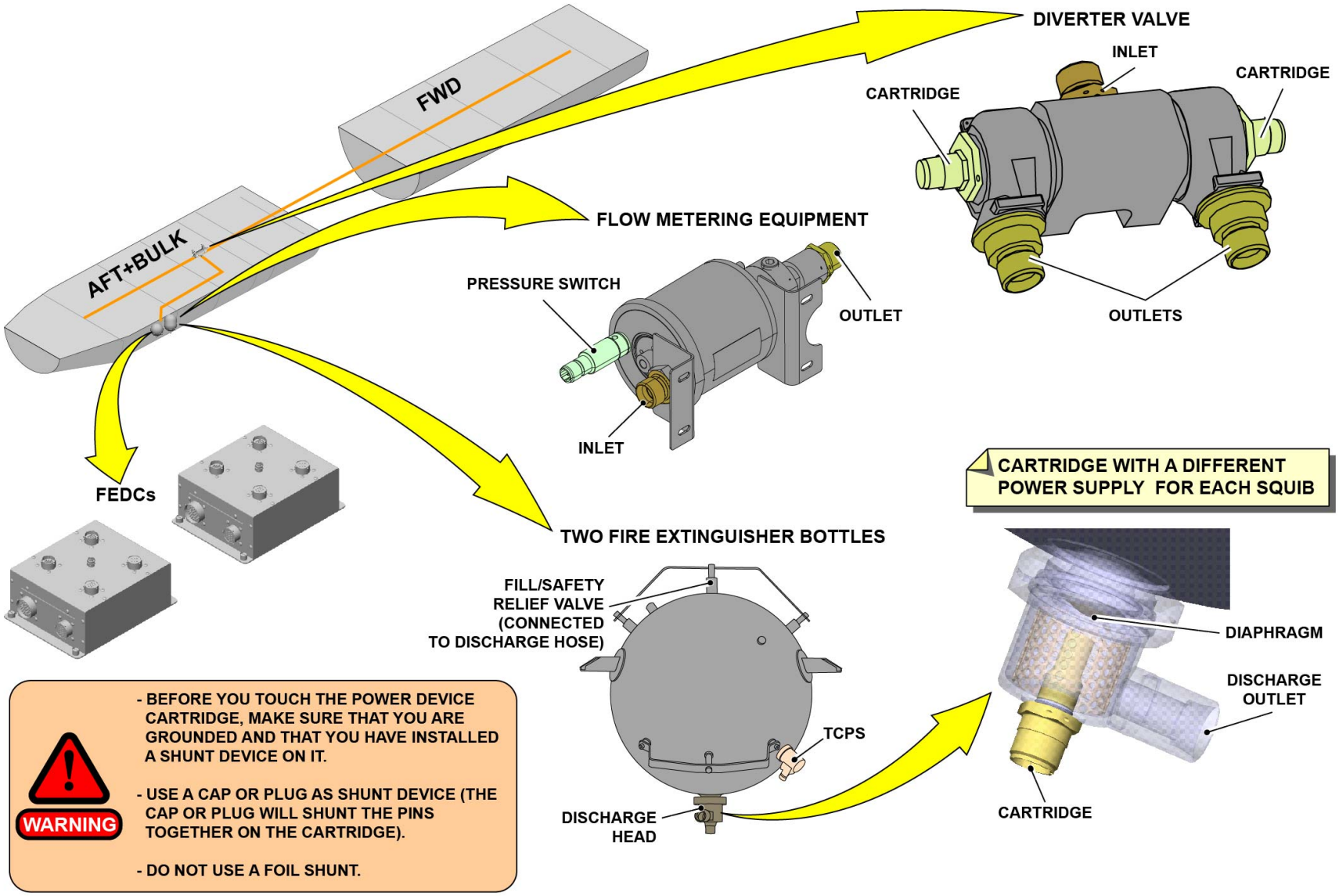
Fire Extinguishing Function/Description (continued)

Components description

The high-rated (bottle 1) and flow-metered (bottle 2) cargo fire-extinguisher bottles, are installed in the aft cargo compartment.
The fire extinguisher bottles contain the fire-extinguishing agent (Halon 1301). Each bottle has:
- A Temperature Compensated Pressure Switch (TCPS)
- A fill and safety relief valve (connected to a discharge hose)
- An outlet diaphragm
- A discharge head.

The discharge head has an electrically operated cartridge.
The cartridge has two squibs (squib 1 and squib 2) and each squib has its own power supply.
When the electrical power supplies the squibs, the explosive charge of the cartridge fires and causes the metal diaphragm in the discharge outlet to break.
The Flow Metering Equipment (FME) is installed in the aft cargo compartment, between the flow-metered fire-extinguisher bottle (bottle 2) and the diverter valve.
It controls the outflow of bottle 2 and has a pressure switch to make sure that the bottle is correctly discharged.
The diverter valve is installed on the ceiling of the aft cargo compartment.
It has one inlet for the extinguishing agent supply. It has two outlets to discharge it through one piping to the FWD cargo compartment or through another piping to the aft/bulk cargo compartment.
Each diverter valve outlet has a cartridge with two squibs. The extinguishing agent flows to the FWD or aft/bulk cargo compartment in relation to the cartridge squibs which are electrically supplied.
The FEDCs are installed in the aft cargo compartment, next to the extinguisher bottles.

V2414251 - V00T0MM0 - VM26D5CARGO3001


DIVERTER VALVE
INLET
CARTRIDGE
CARTRIDGE
OUTLETS
FWD
AFT+BULK
FLOW METERING EQUIPMENT
PRESSURE SWITCH
OUTLET
INLET
FEDCs
CARTRIDGE WITH A DIFFERENT POWER SUPPLY FOR EACH SQUIB
TWO FIRE EXTINGUISHER BOTTLES
FILL/SAFETY RELIEF VALVE (CONNECTED TO DISCHARGE HOSE)
TCPS
DISCHARGE HEAD
DIAPHRAGM
DISCHARGE OUTLET
CARTRIDGE
WARNING
- BEFORE YOU TOUCH THE POWER DEVICE CARTRIDGE, MAKE SURE THAT YOU ARE GROUNDED AND THAT YOU HAVE INSTALLED A SHUNT DEVICE ON IT.
- USE A CAP OR PLUG AS SHUNT DEVICE (THE CAP OR PLUG WILL SHUNT THE PINS TOGETHER ON THE CARTRIDGE).
- DO NOT USE A FOIL SHUNT.

FIRE EXTINGUISHING FUNCTION/DESCRIPTION - COMPONENTS DESCRIPTION

AVIONICS AND ADDITIONAL ELECTRONICS COMPARTMENT SMOKE DETECTION DESCRIPTION (2/3)

Smoke Detection Function/Description

The Smoke Detection System (SDS) of the avionics and additional electronics compartments monitors the smoke occurrence in:
- The avionics compartment
- The In-Flight Entertainment Center (IFEC)
- The connectivity rack.

It sends the related smoke warnings to the cockpit.
The primary components of the system are:
- Smoke detectors
- CIDS/Smoke Detection Function (SDF).

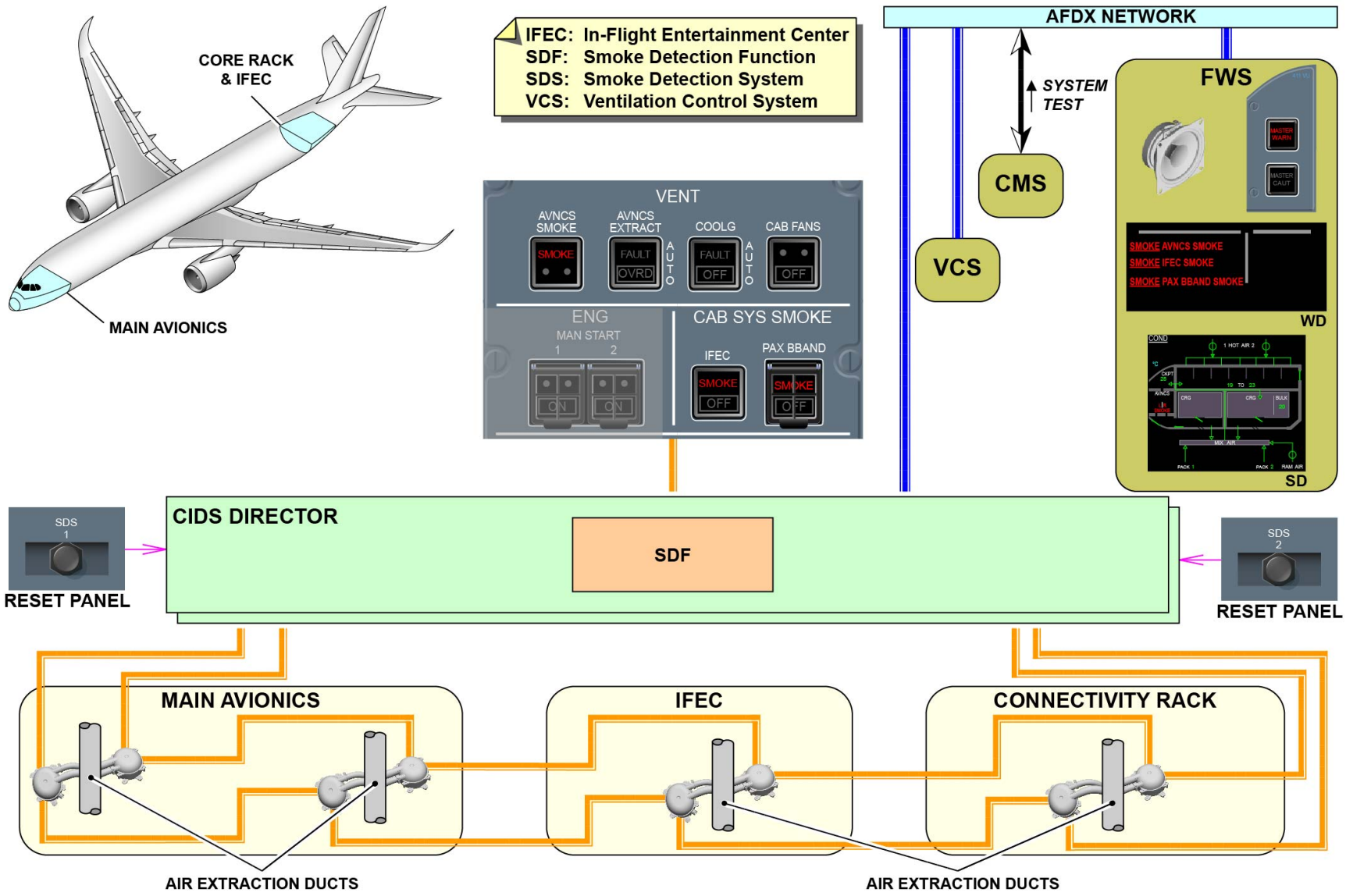
Components function/description

CIDS/SDF
For redundancy, there are two SDF partitions:
- One inside each CIDS director.

By default, the SDF, hosted in the CIDS1 is active and the other SDF, hosted in the CIDS2 is in standby.
The SDF partition is a field loadable software to control and monitor smoke detectors.
For an air extraction by the ducts, the CIDS/SDF sends a smoke warning message to the cockpit through the FWS when:
- Two smoke detectors of a pair sense smoke
- One detector of a pair is identified defective and the other one senses smoke.

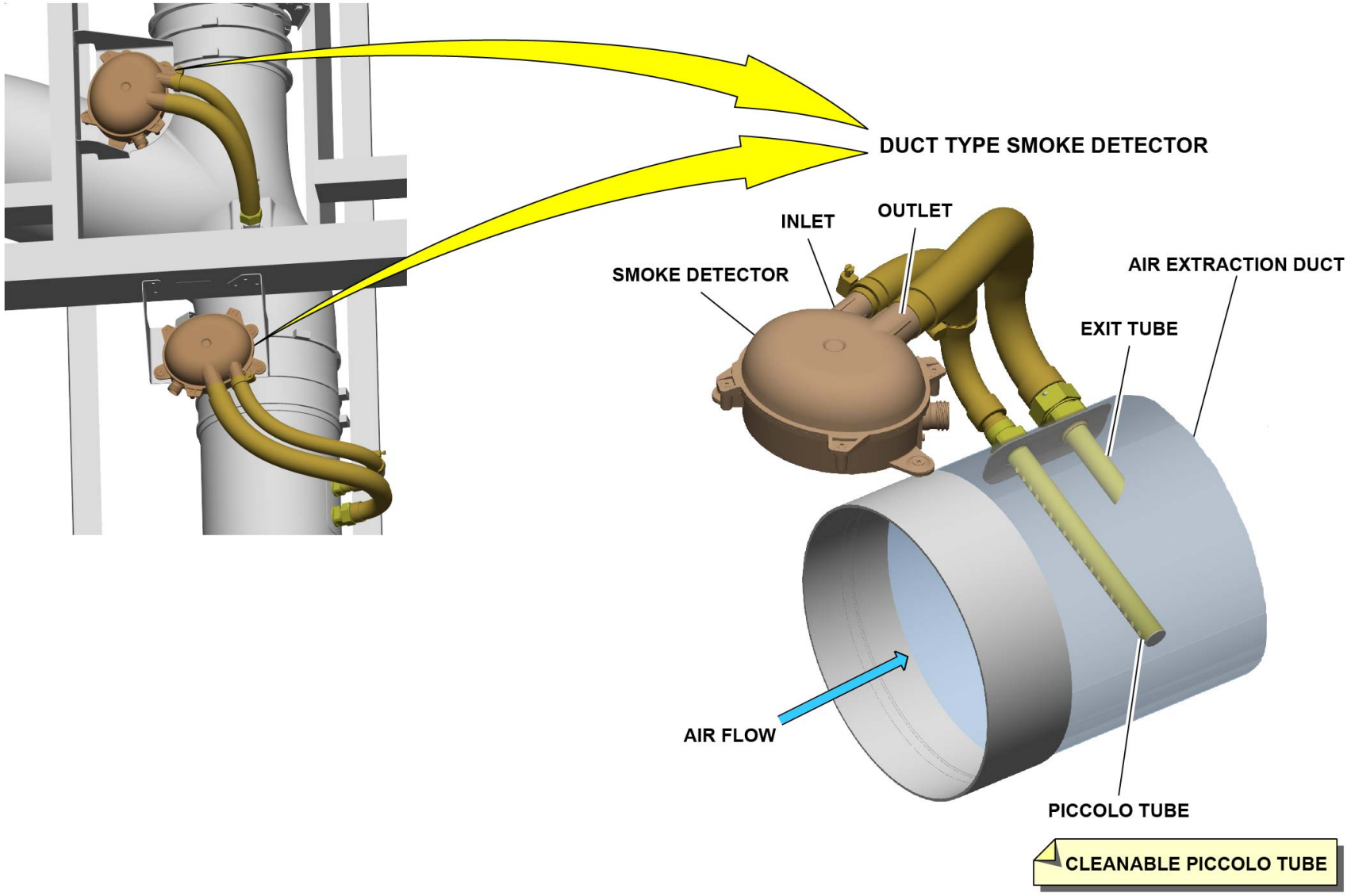
In addition, if there is smoke in the avionics compartment or IFEC or connectivity rack, an AVNCS SMOKE or IFEC SMOKE or PAX BBAND SMOKE red light comes on.
If there is smoke detection in the IFEC or in the connectivity rack, a signal is also sent to the Ventilation Control System (VCS) to stop the ventilation of the related compartment.
It is possible to do a reset of the CIDS/SDF with the related reset switches.
Smoke detectors
Pairs of smoke detectors are installed on the air extraction ducts of the ventilation system of the avionics, IFEC, and connectivity rack compartments.
The smoke detectors are duct-type smoke detectors used for compartments or equipment racks with a forced cooling air.
The air in the related extraction duct flows through a piccolo tube into the sealed housing of the smoke detector. It is sent back to the extraction duct with a different tube.
The smoke detector senses if there are combustion particles in the air.
The piccolo tubes can become clogged with dirt or dust and it is then necessary to clean them.

V2414251 - V00T0MM0 - VM26D6AVION3001



SMOKE DETECTION FUNCTION/DESCRIPTION - COMPONENTS FUNCTION/DESCRIPTION

V2414251 - V00T0MM0 - VM26D6AVION3001



SMOKE DETECTION FUNCTION/DESCRIPTION - COMPONENTS FUNCTION/DESCRIPTION

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V2414251 - V00T0MM0 - VM26D6AVION3001

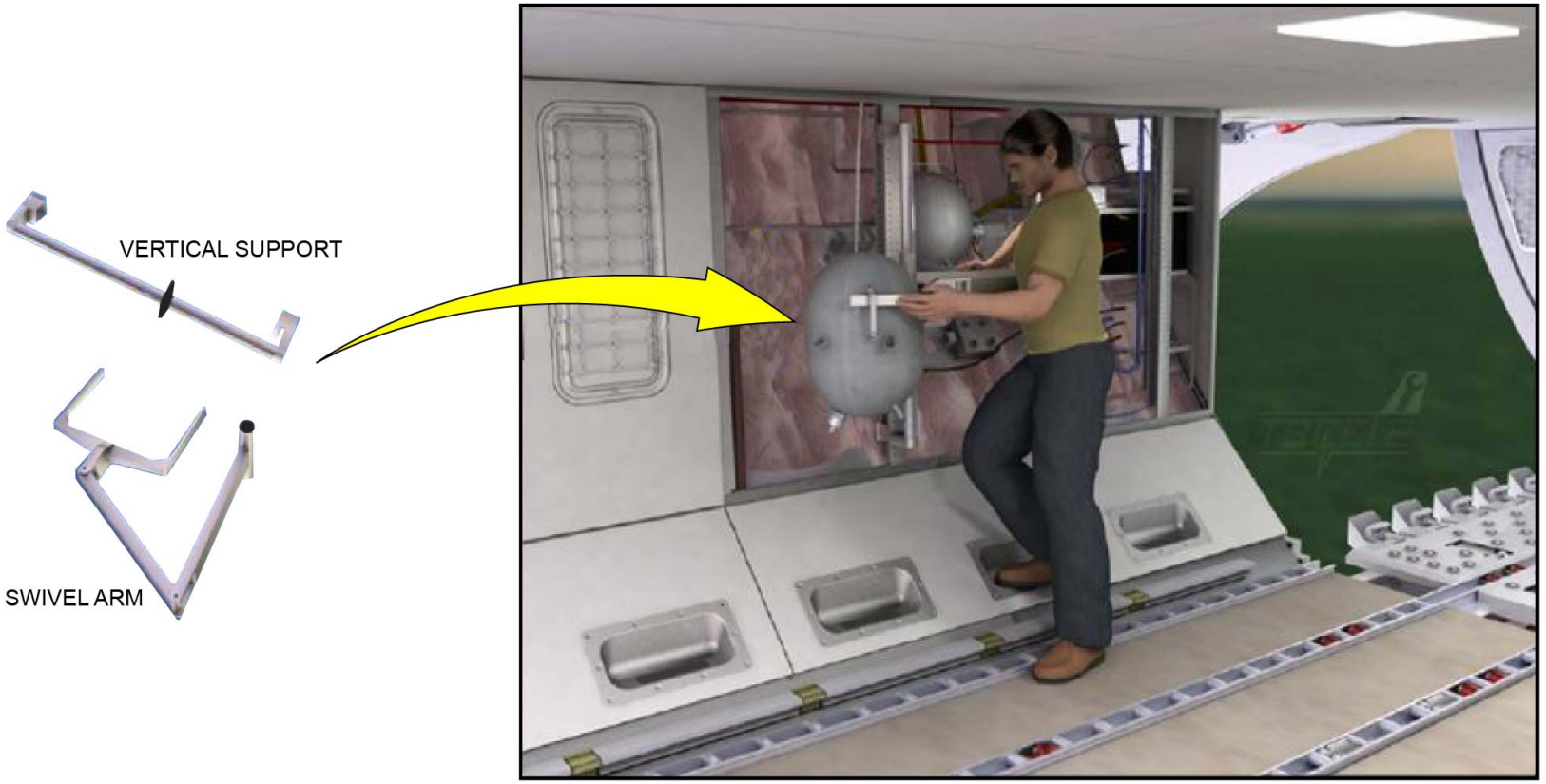
PRESSURIZED AREAS FIRE PROTECTION SYSTEM MAINTENANCE (2/3)

Cargo Fire Extinguisher Bottles - Removal/Installation

Cargo fire extinguisher bottles - removal/installation- specific tool

A special tool has to be used for the removal or the installation of the cargo-compartment fire-extinguisher bottles because of the weight of the bottles. The tool is light and easy to handle compared to other aircraft tools.

V2414251 - V00T0MM0 - VM26M1MAINT3001



CARGO FIRE EXTINGUISHER BOTTLES - REMOVAL/INSTALLATION - CARGO FIRE EXTINGUISHER BOTTLES - REMOVAL/INSTALLATION- SPECIFIC TOOL

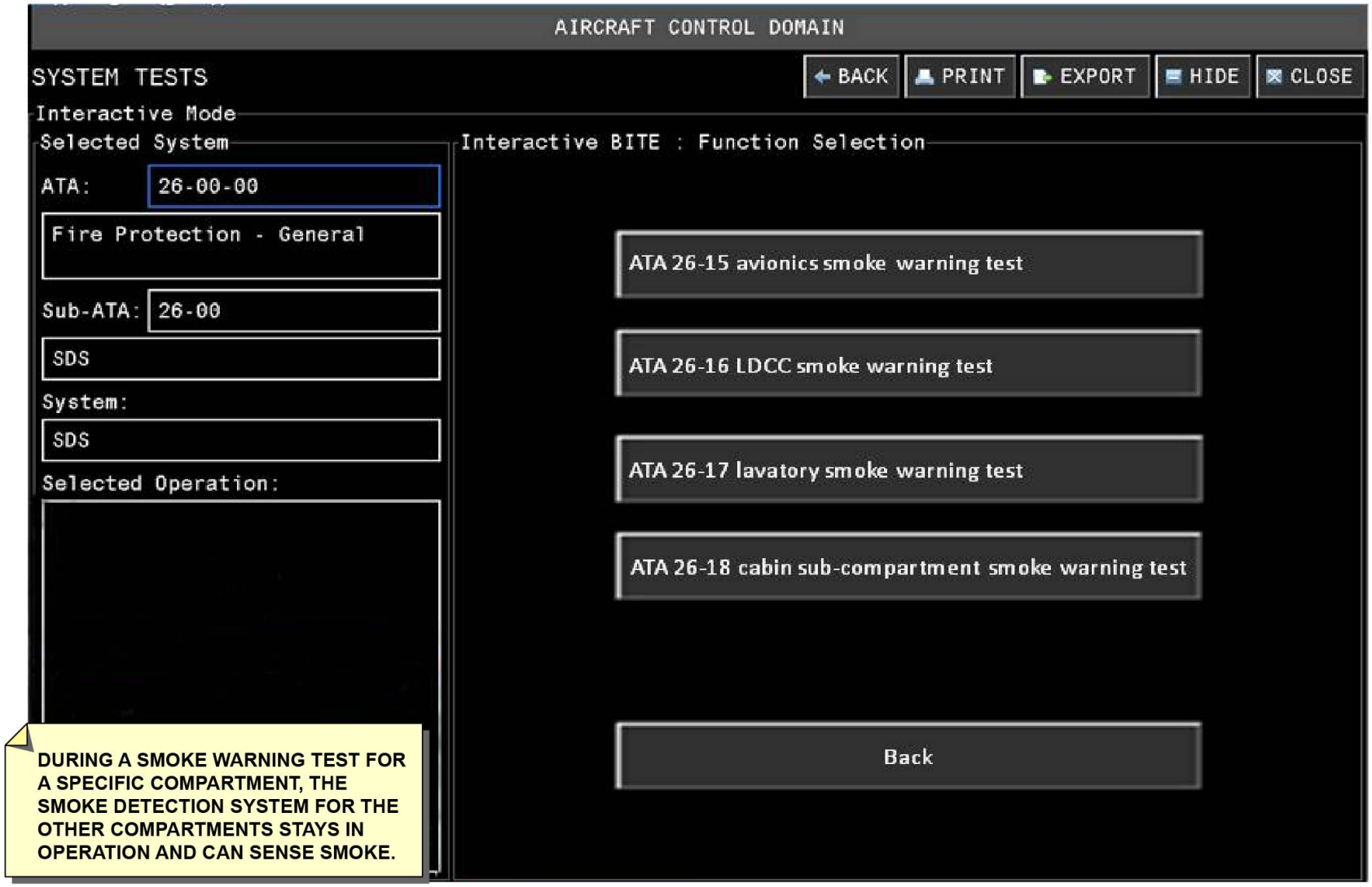
PRESSURIZED AREAS FIRE PROTECTION SYSTEM MAINTENANCE (2/3)

CMS Tests of Pressurized Area Fire Protection Systems

CMS tests of pressurized area fire protection systems-maintenance note

For the pressurized area compartments, several test of the CMS/Smoke Detection Function (SDF) are available.
If a smoke warning test for a special compartment is launched, the smoke detection system for the other compartments stays in operation and can sense the smoke.

V2414251 - V00T0MM0 - VM26M1MAINT3001



CMS TESTS OF PRESSURIZED AREA FIRE PROTECTION SYSTEMS - CMS TESTS OF PRESSURIZED AREA FIRE PROTECTION SYSTEMS- MAINTENANCE NOTE

SMOKE DETECTION SYSTEM CONTROL AND INDICATING (2/3)

Smoke Detection System - General (2)

A cockpit CARGO SMOKE panel is used for controls and indications in case of smoke detection.
On the CARGO SMOKE panel:
- The red SMOKE light illuminates on the AGENT TO FWD or AGENT TO AFT pushbutton switch when smoke is detected in the associated cargo compartment.
When AGENT TO FWD or AGENT TO AFT pushbutton is pressed in, the DISCH light on the pushbutton illuminates to indicate activation of the extinguishing system in the associated cargo compartment.
- The BTL 1 & BTL 2 lights illuminate when the corresponding bottles are discharged.
On the cockpit VENT panel, a red AVNCS SMOKE LIGHT illuminates when smoke is detected in the ventilation system of the avionics bay.
A cockpit CAB SYS SMOKE panel is used for controls and indications in case of a smoke event in the IFE compartment and/or connectivity rack.
On the CAB SYS SMOKE panel:
- A red SMOKE light illuminates on an IFEC P/B SW when smoke is detected in the ventilation system of the IFE compartment.
When the IFEC P/B SW is pressed, the IFE ventilation is stopped and electrical power to the IFE system is cut off.
- A red SMOKE light illuminates on a PAX BBAND P/B SW when smoke is detected in the ventilation air extraction duct of the connectivity rack.
When the PAX BBAND P/B SW is pressed, the connectivity rack ventilation is stopped and electrical power of the corresponding electronic units is cut off.
In case of a smoke detection, a smoke warning message is displayed on the Warning Display (WD) for the associated compartment.
The red attention getters MASTER WARNING lights are illuminated with a cockpit Continuous Repetitive Chime (CRC).
When smoke is detected in cargo and/or ventilation system of main avionics compartment, red SMOKE indication(s) appear(s) on the System Display (SD) COND page for the associated compartment(s).
When smoke is detected in lavatories and/or crew rest compartments, the SMOKE DETECTION page on the FAP pops up automatically and shows in red the zone where smoke is detected.

AFT Cargo Smoke Warning on Ground (2)

In case of a smoke detection in the AFT/BULK cargo compartment:
- On the WD, the message SMOKE AFT/BULK CARGO SMOKE is displayed.
- On the SD, the COND page appears with SMOKE red indication in the AFT/BULK cargo.
The cargo smoke detection automatically stops the ventilation of the corresponding compartment (isolation valves closure).
- On the CARGO SMOKE panel, the red SMOKE light illuminates on the AGENT TO AFT P/B (SMOKE light will remain on as long as smoke is detected).
On the CARGO AIR COND panel, the AFT and BULK cargo isolation valves P/B(s) have to be selected to the OFF position.
On the CARGO SMOKE panel, by pushing the AGENT TO AFT P/B, the DISCH light illuminates and the fire extinguishing agent is discharging in the AFT/BULK cargo compartment.
On the VENT panel, the CAB FANS P/B has to be selected to the OFF position.
On the CARGO AIR COND panel, the CARGO BULK HEATER P/B has to be selected to the OFF position.
When extinguishing bottles are discharged the corresponding BTL1(2) lights illuminate. BTL2 light appears later on due to the slow discharge of the bottle.

V2414251 - V00T0MM0 - VM26I2SMOKE3001

Avionics Smoke Warning (2)

In case of a smoke detection in the left (or right) air extraction system of the avionics compartment:
- On the WD, the message SMOKE L(R) AVNCS SMOKE is displayed.
- On the SD, the COND page appears with SMOKE red indication in the Left (right) side of the avionics bay.
- On the VENT panel, the red SMOKE light illuminates on the AVNCS P/B

IFEC Smoke Warning (2)

In case of a smoke detection in the IFE bay:
- On the WD, the message SMOKE IFE BAY SMOKE is displayed.
- On the CAB SYS SMOKE panel, the red SMOKE light illuminates on the IFEC P/B.

If IFEC smoke is detected, IFEC ventilation system is automatically stopped and electrical power to IFE system is cut off.
The IFEC P/BSW is set to OFF in order to confirm the ventilation is stopped and electrical power is cut off.

Connectivity Rack Smoke Warning (2)

In case of a smoke detection in the connectivity rack:
- On the WD, the message SMOKE PAX BBAND SMOKE is displayed.
- On the CAB SYS SMOKE panel, the red SMOKE light illuminates on the PAX BBAND P/B.

If a smoke is detected in the connectivity rack, the rack ventilation system is automatically stopped and electrical power to related electronic units is cut off.
The PAX BBAND P/BSW is set to OFF in order to confirm the ventilation system is stopped and electrical power is cut off.

Lavatory Smoke Warning (2)

In case of a smoke detection in a lavatory:
- On the WD, the message SMOKE LAVATORY SMOKE is displayed.
- On the Flight Attendant Panel (FAP), the SMOKE DETECTION page appears to give a warning indication and the affected lavatory location.
- On the Area Call Panels (ACP), an amber light flashes (ACP are located in the EXIT signs above the aisles).
- On the Attendant Indication Panels (AIP), the name of affected lavatory in clear wording is indicated (e.g. "Smoke Alert LAV 01"). AIP is combined with a cabin handset and located at least at every door.
- On the lavatory external wall, an amber light flashes.
- A triple low chime sounds in the cabin.

The WD message is generated to cockpit for crew awareness purpose.
Flight Crew will maintain contact with Cabin Crew to follow up status of Smoke.
Actions have to be taken by Cabin Crew (first action is to identify the affected lavatory).
A smoke reset P/B on the FAP is used to reset all aural warnings in the cabin and visual warnings on ACP and AIP.
The Additional Attendant Panels (AAP) are optionally installed in different cabin areas, as attendant areas, doorframe linings, crew rest compartments, galleys. In case of a lavatory smoke detection, AAP indicate the name of the lavatory concerned and include a smoke reset P/B.
The smoke reset P/B is used for the same functions as the smoke reset PB on the FAP.

Cabin Crew Rest Compartment Smoke Warning (2)

In case of a smoke detection in a cabin crew rest compartment:
- On the WD, the message SMOKE CABIN REST is displayed.
- On the FAP, the SMOKE DETECTION page appears to give the warning indication and the affected crew rest compartment location.
- On the ACP, an amber light flashes.
- On the AIP, the name of the affected crew rest compartment is indicated.
- On the crew rest compartment external wall, an amber light flashes.
- A triple low chime sounds in the cabin.

V2414251 - V00T0MM0 - VM26I2SMOKE3001

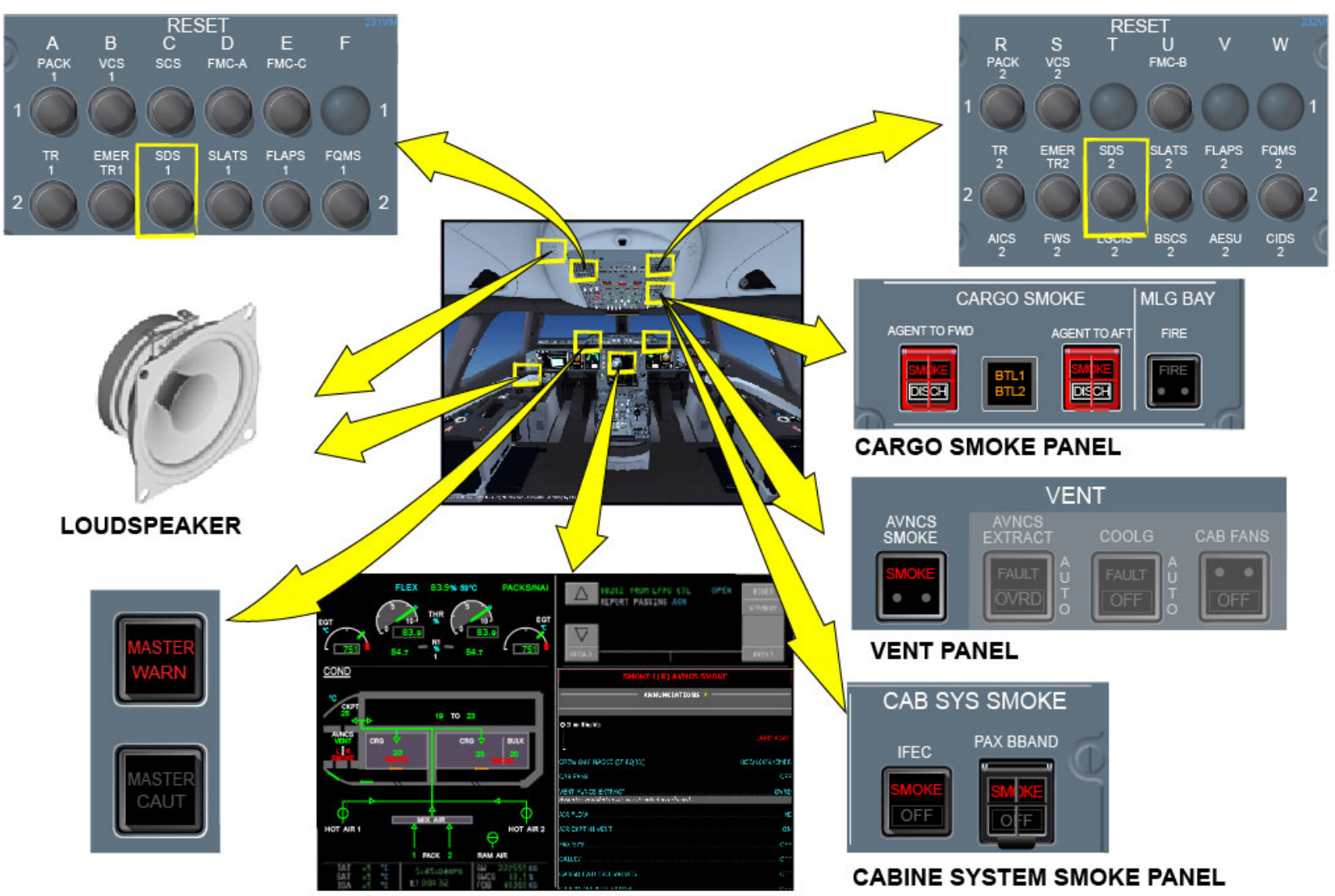
The WD message is generated to cockpit for crew awareness purpose. Flight Crew will maintain contact with Cabin Crew to follow up status of Smoke.

Actions have to be taken by Cabin Crew (1st action is to identify the affected compartment).
A smoke reset P/B on the FAP is used to reset all aural warnings in the cabin and visual warnings on ACP and AIP.
The AAP are optionally installed in different cabin areas, as attendant areas, doorframe linings, crew rest compartments, galleys. In case of a crew rest compartment smoke detection, AAP indicate the name of the crew rest compartment concerned by smoke detection and includes a smoke reset PB.
The smoke reset P/B is used for the same functions as the smoke reset P/B on the FAP.

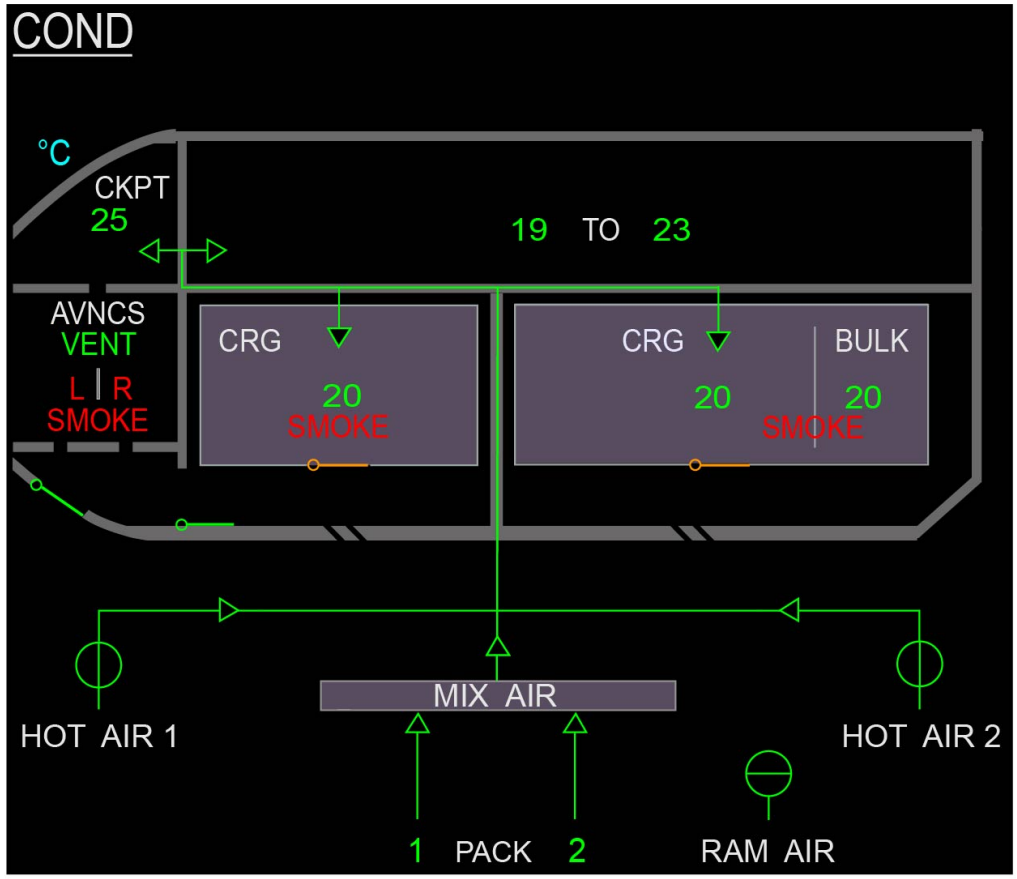
Avionics and Lavatory Smoke Detection Fault (3)

In case of a failure of both smoke detectors in the left (or right) air extraction duct of the avionics compartment, an ECAM caution SMOKE L(R) AVNCS DET FAULT message is triggered with a cockpit Single Chime.
The SD COND page automatically pops out.
In case of a failure of one lavatory smoke detector, an ECAM caution SMOKE LAVATORY DET FAULT message is triggered with a cockpit Single Chime.
The CIDS director displays a caution indicator on the FAP with a message referring to the SMOKE DETECTION page. A cabin triple chime is associated.
To find out which detector is faulty, the SMOKE DETECT button on the FAP has to be manually selected.
The SMOKE DETECTION page shows:
- A CAUTION indicator,
- SMOKE DETECTOR INOP OR NO DATA AVAILABLE legend,
- The position of the related lavatory.

V2414251 - V00T0MM0 - VM26I2SMOKE3001



SMOKE DETECTION SYSTEM - GENERAL (2) ... AVIONICS AND LAVATORY SMOKE DETECTION FAULT (3)



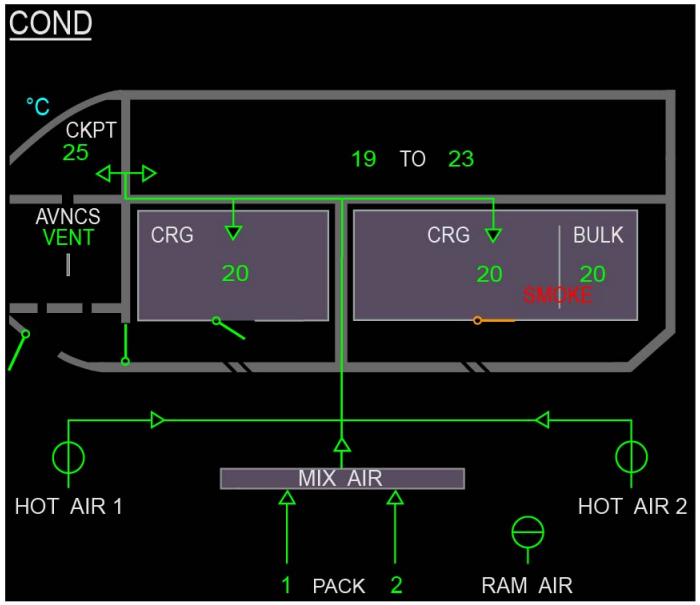
COND SD PAGE

SMOKE DETECTION SYSTEM - GENERAL (2) ... AVIONICS AND LAVATORY SMOKE DETECTION FAULT (3)

V2414251 - V00T0MM0 - VM26I2SMOKE3001

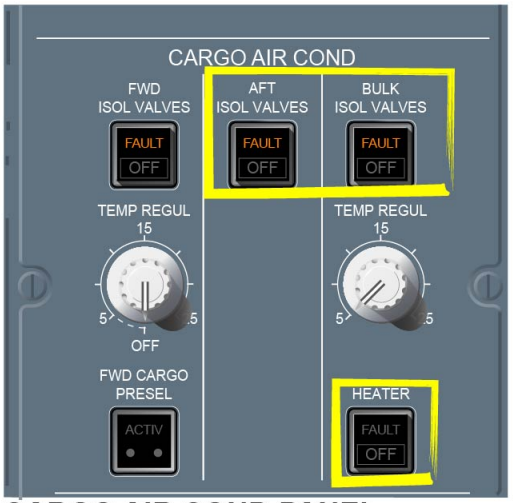
SMOKE DETECTION FAP PAGE

SMOKE DETECTION SYSTEM - GENERAL (2) ... AVIONICS AND LAVATORY SMOKE DETECTION FAULT (3)



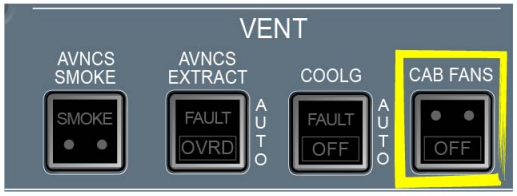
COND SD PAGE

WARNING DISPLAY



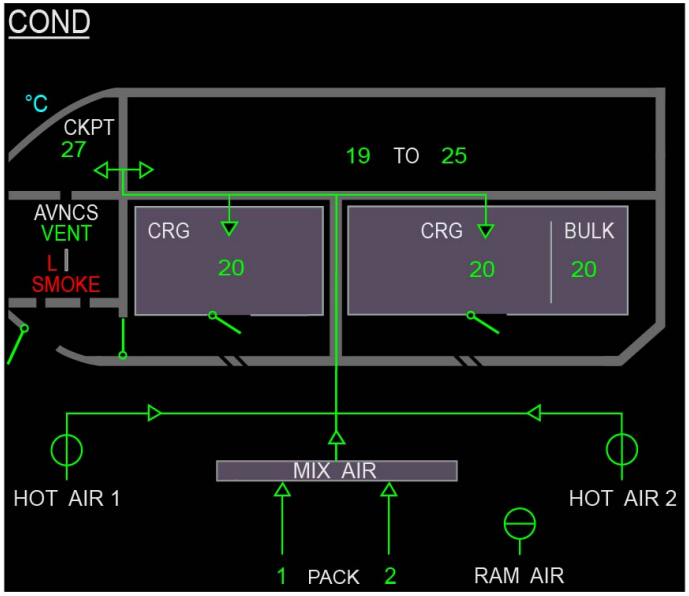
CARGO AIR COND PANEL

CARGO SMOKE PANEL



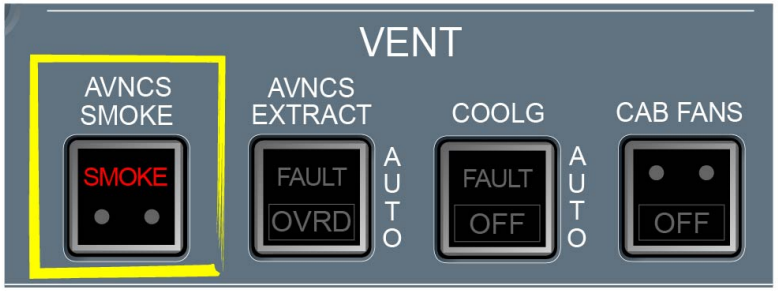
VENT PANEL

SMOKE DETECTION SYSTEM - GENERAL (2) ... AVIONICS AND LAVATORY SMOKE DETECTION FAULT (3)



COND SD PAGE

WARNING DISPLAY

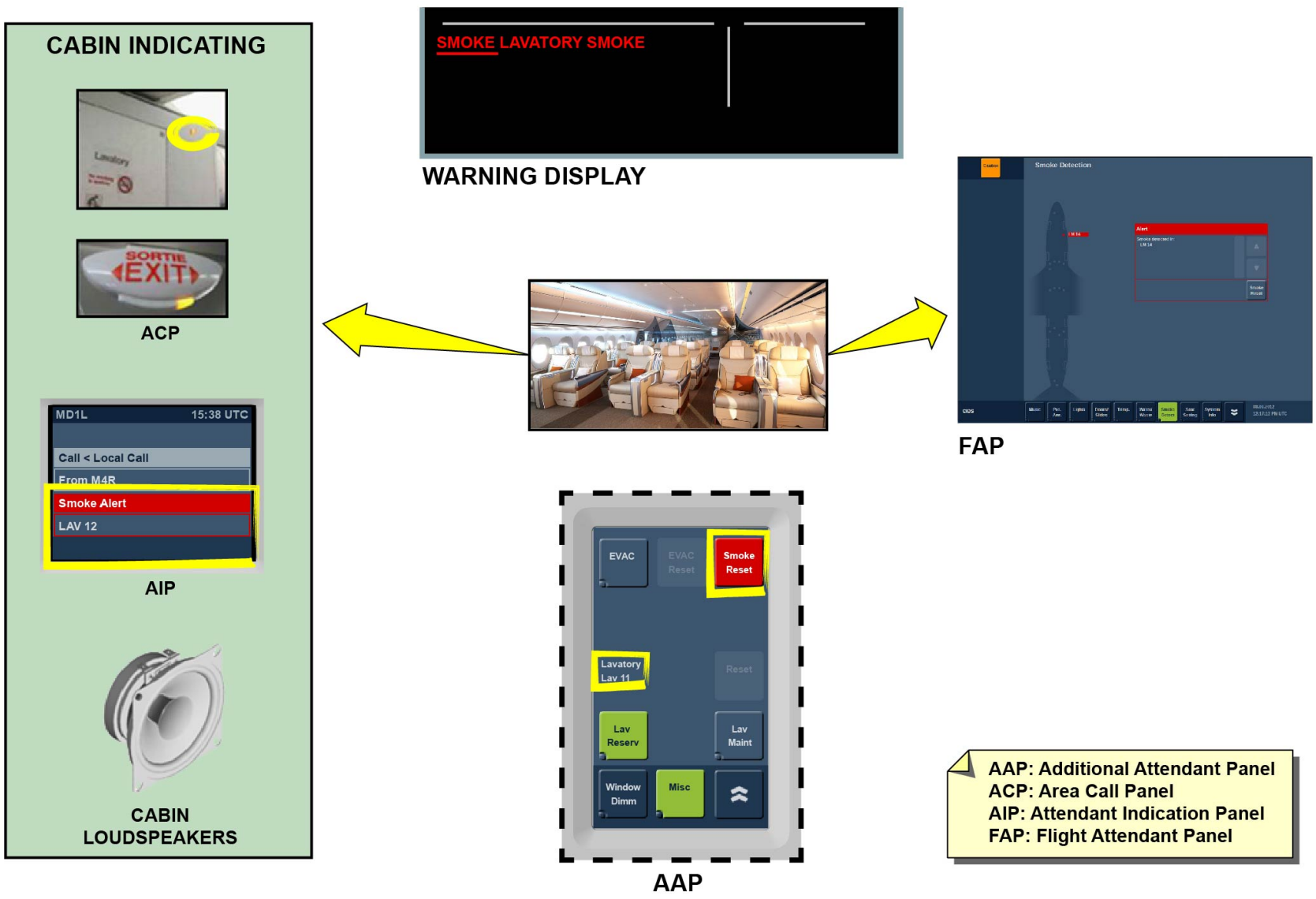


VENT PANEL

WARNING DISPLAY

WARNING DISPLAY

SMOKE DETECTION SYSTEM - GENERAL (2) ... AVIONICS AND LAVATORY SMOKE DETECTION FAULT (3)



SMOKE DETECTION SYSTEM - GENERAL (2) ... AVIONICS AND LAVATORY SMOKE DETECTION FAULT (3)

FLIGHT ATTENDANT PANEL

SMOKE DETECTION

SMOKE DETECTION SYSTEM - GENERAL (2) ... AVIONICS AND LAVATORY SMOKE DETECTION FAULT (3)

V2414251 - V00T0MM0 - VM26I2SMOKE3001

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